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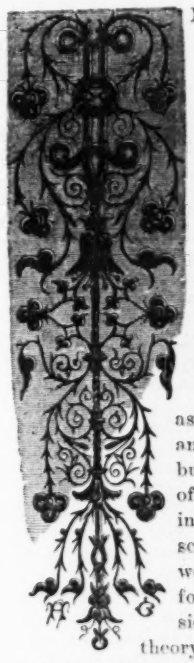
What is "Proportion"?



IN connexion with the question whether the existence of measurable ratios between the different parts of a design is an integral element in design,* there is the question what is really meant by the term "proportion," which so often comes into controversies on this subject. Architects and architectural critics have talked about "proportion" from time immemorial. Whenever there is an argument as to whether or not the antique or the Mediæval builders used special ratios of height, breadth, and length in their buildings, and in the scale of their details, the word "proportion" is always forthcoming, usually on the side of the measurement theory. The proportions of buildings cannot be good, the advocates of geometry will say, unless the respective sizes have a certain ratio to one another. The reply will be that proportion is to be judged by the eye, not calculated by figures. We feel certain buildings to be well proportioned, others to be ill proportioned. They are the one or the other, for we see and feel that they are, but we cannot put the reason in the form of a mathematical proposition. The public get hold of the word and make fine havoc with it, as when they repeat the heresy that St. Peter's is so well proportioned that you do not perceive its size. This little formula of amateur criticism is by no means dead yet; we heard it delivered, with all the confidence of innocence, over a dinner-table the other day, and no doubt a suggestion that it was a popular fallacy would have been received as a very unkind, not to say ungentlemanly, rejoinder. It is too much, perhaps, to expect that those who use such an absurd phrase at all should be able to explain what they mean by the words, or why it should be an advantage or a beauty in a building that it should look smaller than it really is. The phrase would be all right and true enough if people would leave out the "well," and say merely "St. Peter's is so proportioned that it looks smaller than it really is," which would be a simple statement of a fact in brief terms. But if we pause to inquire what is the intellectual idea summed up in the words "so proportioned" in that case; what is meant by proportion, and how it affects the apparent scale of the building, possibly even some of those whose conception of the matter is correct would find it difficult to express that conception in definite language.

The idea of proportion involves the idea of relation to some standard, and may be used in reference either to the relation of parts to each other, the relation of parts to the whole, or the relation of the whole to some separate external standard. But of what nature is this relation, and what renders it pleasing or unpleasing, as the case may be?

In considering that point, we have one great difficulty to deal with at the outset. It is exceedingly difficult,—perhaps we might say in many cases almost impossible,—to decide how much of the impression of good or bad proportion is due to mere habit of the eye. There is no doubt that habit has a good deal to do with it. We are habituated to certain proportions in the parts of a Classic cornice, and a certain degree of projection relatively to the height of the cornice, and so on; and a cornice with only half the usual projection would strike our eyes with a certain degree of annoyance of the same nature as that which we feel when we hear bad grammar or mispronunciation from an uneducated man. Yet it would be hard to prove that there is any special fitness in the precise degree of projection usually allotted to the Classic cornice. A very much less projection in a Gothic cornice of the same depth does not displease us, because in connexion with Gothic detail we are accustomed to a less projection of that particular member of the architecture. It is possible that if we had always been accustomed to see Doric columns of the thick proportions of the ancient Corinthian or Silician Doric, we should feel the column of the Parthenon to be over-attenuated, which now we feel to be about the golden mean of proportion for that style. It is possible that were we accustomed to see men with necks 18 in. long we should regard the ordinary length of neck as it does exist with dissatisfaction, as somewhat of a *lusus naturæ*. It is possible, but we do not think it is probable. For in both these cases, as in many others that might be named, our judgment is influenced, even without our knowing it, by the practical suitability of the parts for the office they are to perform. Where this practical suitability is not much influenced by change in the proportion, there our sense of proportion may be, and probably is, largely due to habit. But these cases, whether in natural or artificial constructions, are by no means so numerous as they may at first be supposed to be. In natural constructions,—*i.e.*, in men and animals,—there are very few such cases; Darwin has taught us that. Almost every portion of human and animal construction has taken its characteristic shape because that shape was best suited to the circumstances of life among which the organism was placed, and under which, in fact, it assumed its form; and a very slight observation of the circumstances of its life enables us to recognise this suitability of the form, and to respect it as well proportioned. No doubt, any one who had not previously seen a giraffe, and saw one for the first time in a loose-box at Regent's Park, would think it an absurd and ill-proportioned animal. But let him see it feeding off the top sprouts of a palm-tree, and it would assume a very different aspect. It would appear just proportioned to the situation, and even the upward slope of the back to the shoulders would appear as a part of the general up-reaching tendency of the whole make of the creature, and completely in harmony with its elongated neck. And in like manner there is a relation between the symmetry which we feel to exist in what we call a well-shaped human figure, and the circumstances to which that shape is adapted. The bodily figure is, in fact, to use a phrase often applied to mental characteristics, the "creature of circumstances," and it is impossible that we, with our present experiences of life, should regard any figure materially differing from the normal buman figure as well proportioned, because our experience tacitly teaches us that no proportions materially different from these would be suitable to the circumstances of actual life and movement, and to the tasks which the body has to perform. The attempts of painters like Fuseli and Rossetti to produce ideal forms of men and women, which shall be superior to the actual forms of life, have therefore always failed and always must fail to satisfy the eye, because we can only judge of proportion in the human figure in relation to our own human experience of life, and an ideal figure could only satisfy us if we could realise to ourselves an ideal life to which that figure would be related, and in regard to which it would appear properly proportioned. As to what is called a canon of proportion of the human figure, that merely means a practical recognition of the fact that the best figure will be that which is, in all its points, best proportioned to its work; and the system of settling that proportion by taking the mean measurements of a great number of the most typical figures is the perfectly logical and correct one, because the measurement which is found to predominate will necessarily be the one which is best proportioned in relation to existing circumstances.

The application of this reasoning to architectural design appears to furnish the key to one meaning, and perhaps the most important meaning, of the word "proportion" in regard to work done by human hands. We say one meaning because, as we shall have to notice just now, there is another sense in which the idea of proportion may be regarded, involving a different class of relationship. But in considering the proportions of a building with reference to the forces operating upon the building, we get an explanation of the difference between good

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* See articles on "Measurement and Design," in the two preceding numbers.

and bad proportion analogous to that which is illustrated by the relation of the human figure to the forces with which it has to deal. Take a column as an example: the object of a column is to hold a portion of a building aloft; height is a requisite, therefore, to it; a very low and stumpy column would appear as a feature ridiculously falling short of its obvious intention. But stability is also a requisite of the column, as of every part of architecture, and therefore the height must be limited to that which will appear, when regarded in relation to the thickness of the column and to the mass it has to carry, as not too great for perfect stability. Regarding it in this light, we can see that the Parthenon column has a claim to be regarded as better proportioned than that of Corinth or Pæstum; in the latter the appearance of stability is in excess. But any considerably greater height given to the Parthenon column would spoil its proportion by too much reducing stability, in consideration of the massive design of the superstructure. The columns of the Ionic and Corinthian order allow greater height in relation to the width, but the entablature also is lighter. In Gothic architecture an immensely increased tenuity is given to the column (if we regard the vaulting shaft as taking the place of the column), and yet it looks agreeable to the eye, but that is because we know that the whole thing is play; the shaft does not support the weight of the vault, it merely supports, or appears to support, the lines of the ribs. The appearance of a shaft of even half that degree of tenuity relatively to its height, if it were really doing, or appearing to be doing, work, would be unbearable. We can compound with the effect of thin iron columns under a much more massive superstructure of stone; it is not agreeable chiefly because our eyes are accustomed to see stone proportions carried throughout a building, and the thin columns disagreeably clash with the habit of proportion to which the eye has been accustomed; still, we know as a fact that they are stable and equal to their work, and the sense of disproportion can be to some extent got over. Make their surface a complete imitation of stone, and the sense of disproportion would be unbearable.

This sense of statical proportion, more or less, governs visual proportion throughout the building. A shallow architrave, with a deep and heavy frieze, offends our sense of proportion, independently of all habits of taste and all ideas as to mathematical proportion, because we feel that the architrave is not sufficient for its work. The converse, a heavy architrave and a light entablature, is equally offensive to the sense of proportion, the architrave being "disproportionately" heavy for what it has to do. Lighten the architrave proportionately to the frieze, and then we at once find that the column is too massive for the superstructure, and our sense of visual proportion is again offended, for the same reason, because the statical proportions are wrong. And when builders show, as the builders of Beauvais did, a marked want of perception as to proportion, although the visual disproportion might withstand the attacks of criticism, the statical disproportion comes to its aid and compels a readjustment, whether the builders will or no.

This connexion between visual proportion and statical proportion may be exemplified in the utter want of proportion which is to be observed in much semi-barbarous architecture, where, as in many examples in Hindu and Cambodian architecture, the superstructure is out of all proportion to the substructure, and ponderous cupolas are piled up on an insignificant base; and the principle may be traced also in regard to ornamental design. In designs based upon foliage, for example, there must be preserved an apparent proportion of strength between the stems and the ornaments which they carry. A foliage-design in which the stems should be thick and heavy, and the conventional foliage springing from them small and light, would inevitably affect the eye with a disagreeable sense of wrong proportion, and *vice versâ*. It only needs a recognition of the principle to trace its influence continually in discriminating the good or bad qualities of decorative design.

There is, however, another practical consideration having its influence on proportion; one which comes under the head of proportion referable to some outside standard not contained in the structure itself. In regard to architecture this outside standard is the human figure itself. All buildings are erected by human hands for human use in one way or another, and hence the scale of the human figure becomes, in regard to architectural proportion, a kind of "constant," the effect of which must always be taken into account. And here, we may venture to suggest, is perhaps the true explanation of the better effect of some proportions of height, length, and breadth as compared with others. We will not deny that there may be something in the idea that certain geometrical ratios in such dimensions, in interiors, tend to give a better effect than others. But we may suggest that it is quite possible, even probable, that the good effect of such proportions really lies in their relation to the height and proportion of the human figure, and (a point which is seldom taken into account in such speculations) to the visual angle which human vision is capable of including. The capability of grouping of congregations of men so as to be within sight and hearing of each conveniently is another point to be taken into account in the proportioning of interiors. To take a very simple and obvious instance, the proportion and scale of doorways is always tacitly made with some reference to the proportion as well as to the scale of the figure. A wide square doorway would be a very suitable form of entrance to a stable, and in fact, is the form that ought to be adopted, much more often than it is; but every one would feel that an entrance so shaped, whatever its positive scale or size, was relatively of the wrong proportion for an entrance doorway for human beings. However colossal an entrance may be made in point of actual measurements, the instincts of civilised builders have always taught them to preserve in such entrances the usual relation of height to width which has been found the most convenient and suitable for a doorway; and the same instinct influences the general shape of all the openings in buildings, even up to the chancel arch of a large church or cathedral. Buildings are made by and for a race of beings standing upright, not going on the ground or on all fours; and this fact influences, almost without our knowing it, all the proportions of openings in buildings. In the range of angle of our vision, again, we may probably find the secret of the feeling as to proportion of length to breadth, rather than in the mere numerical ratio of measurements considered *per se*. A square room is a bad form, because in a square room the eye can only take in barely one side at a glance, and that only when standing with the back against the opposite wall. A room in the proportion of 3 to 4, or even 4 to 5, allows of one side and part of the return sides being easily seen at a glance, and therefore adapts itself better to the range of vision than a square room. For the same reason, a height which is suitable in a large room is too great for a small room, because the eye cannot then take in the ceiling-line along with the floor-line: the two are beyond the angle of vision. A very low room brings too great a proportion of the floor and ceiling space into the field of view in comparison with the wall space, and thus produces a sense of disproportion, besides being at variance with the demand which upright stature, and the height of the eyes from the ground, creates in favour of a certain elevation in the roof above the eyes. A very long narrow room puts the people and objects at the further end disproportionately far from the eye, and suggests the necessity of movement from one part to the other in order to take it all in; conveying the idea of a passage to move through, rather than a room in which we may conveniently occupy one station.

Thus we may trace in all the proportions of size in an interior, a relation to the scale and movement and power of vision of man, which renders them, to our feeling, well or ill proportioned, according as their proportions are true or not in their relations to ourselves. It may be better to have the length and breadth of a room in an exact ratio to one another; the employment of exact ratios is, at any rate, very much led up to by the mere habit of employing fixed standards of measurement, and renders the subdivision of parts by measurement, in the setting out of details, much simpler by the avoidance of fractions; all which are good substantial reasons in its favour. But that the proportioning of the sides of an apartment according to exact ratios is in itself a chief cause of the appearance of good proportion certainly seems questionable, on the ground that it is a refinement which the eye does not really appreciate, and of the existence of which we cannot be certain by mere observation, until actual measurement has proved it to us: whereas the proportion in relation to our movements and to the visual angle of vision we can readily appreciate. And, therefore, if we were required to pin our faith to any geometrical method of making well-proportioned rooms, we should prefer to dwell not on the relative lengths of the walls in measured feet, or modules, or whatever else we like to term them, but on the relation of the proportions to the range of vision, as calculated from the chief probable points of occupation in the room. If we took the proportions in thus calculating the visual angle from one extreme end of the room, no doubt it would practically come to nearly the same thing as setting out the lengths of the walls in certain proportions. But as a room scarcely ever is looked at from the extreme end, the pretence that its good proportion consists in a relation of the lengths of the sides, which are never actually seen by the eye simultaneously, rests on a very doubtful basis; and it seems much more reasonable and logical to suppose that the true key to the problem is the way in which the room would be seen from an ordinary and habitual point of view, and the angle which would be subtended by that portion of the whole design which it is desirable to be able to see in one view.

But there is also the relation between the building and the actual stature and scale of the being who erects it,—the proportion of positive sizes,—to be considered. This is the most obvious and superficial of all the relations between man and architecture, yet it is one the effect of which has often been strangely overlooked, even to a certain extent by such thoughtful artists as the Greeks. The human figure is the scale by which every building is measured, and to which every building is finally referable. Consequently, the average scale of sizes of parts and details which has been determined by reference to those features (such as doors) which are directly influenced by the scale of the figure, cannot be materially altered without creating a confusion or falsification of scale. This is apparent pre-eminently in the case of doorways themselves: a gigantic doorway only deceives the spectator as to the scale, and dwarfs the building, unless it is accompanied by such details as may aid in restoring the scale. The Mediæval architects seem to have been much more conscious of this fact than the Greek architects, inasmuch as, while giving grandeur and dignity to their doorways by immense recessed portals, they nevertheless left the actual and "practicable" doorway in most cases about the average size, so that the scale referable to the figure was preserved. In the Greek temples there is very little idea of scale in this sense. Two temples, of which one is twice the size of the other, present no apparent difference in scale when seen separately in drawings; it is only when a scale or a figure is added that we can say whether the columns are 15 ft. or 30 ft. in height. This is a distinct defect in Greek architecture, and in this respect there is more true feeling for scale shown in the system suggested by the Romans and pursued by so many of the Renaissance architects, of placing one order of average scale over another in a lofty building, instead of increasing the positive size of the order, and with that lessening the relative scale of the building. We ought to be able to tell from the appearance of a building in the drawing about what size it is; the increase of scale being given, not by increasing the scale of parts, but by multiplying parts on the ordinary scale. The opposite process pursued in St. Peter's is what gives rise, of course, to the often-quoted fallacy about its proportions, referred to just now. It is not a design for a colossal building, but a design for a building of average size magnified; and to make its scale appear true we should require men 12 ft. or 14 ft. in height to inhabit it.

To sum up: we conclude that good proportion in a building and its details depends upon a correspondence between visual proportion and statical proportion in the first instance, and a true reference of the whole building to the stature, vision, and movements of man. There are other points which might be regarded as coming under the head of proportion, but which cannot be referred to so decisive a standard. We may mention two of these: one is that portions which have different functions should not repeat precisely the same length or width,

should not be identical in dimension. As a single instance, take the case of a column or shaft. Where, as in a Gothic shaft, a band is placed in the centre of the height of the shaft, and the treatment of the surface of the shaft is the same above and below, we feel that the proper place for the band is precisely in the centre of the height. But where we have the upper portion of a column fluted and the lower part plain, for instance, we then feel that the dimensions of the two parts should not be the same,—that the division should not be central; though it is difficult to say why this should be so, and it comes more, perhaps, under the head of the more vague perception of taste than as a question of proportion. Another point is that the predominant character of proportions should be carried out consistently throughout the details of a building; *i.e.*, that if the principal masses of the structure, and their supporting piers, are more than ordinarily massive, this character of massiveness should be consistently carried out through all the details. But this again, though it has a certain bearing on the question of proportion, is hardly to be identified with it, and belongs rather to what may be called in the abstract "character," a quality in design which arises from the consistent treatment of every detail so as to intensify the leading idea of the design, whether that idea be grace or massiveness, energy or repose, brightness or gloom. Such qualities as these, however, can only be felt, not defined; they belong to the region of taste and sentiment. But proportion, although we may question whether it can be reduced, as some think, to a mathematical formula, is nevertheless a quality in design closely connected with practical questions, and with which logic and reason have at least as much to do as taste and artistic perception.

SCIENCE AND PRACTICE AT SOUTHAMPTON.

THE address of Dr. Siemens, as president of the British Association, on August 23rd, deals with topics that have a special interest to many of our readers, as having been not unfrequently handled in our own columns. On most of them we are happy to note the full and unhesitating agreement between the views then expressed by this distinguished physicist and our own. More especially do we refer to his expression in the address of the importance of that solidarity which exists between science and industry, on which we very recently remarked, and to the statement that it is to the union of theory and practice that we owe the rapid progress of the present day; the two orders of men "both merging more and more into one class, that of pioneers in the domain of nature."

We shall not attempt an abstract of an address which is *in extenso* so easily attainable by the reader; but we must, in the first place, express the feeling of disappointment with which we read the reference of Dr. Siemens to one point on which he must be regarded as an authority of the first weight, that of the application of electricity to locomotion. The electric railway, said the President, "possesses great advantages over horse or steam power, for our towns, in tunnels, and in all cases where natural sources of energy, such as waterfalls, are available, but it would not be reasonable to suppose that it will in its present condition compete with steam propulsion upon ordinary railways." We have no choice but to accept this statement, far as it falls short of the brilliant promises to which we have, not so very long ago, listened on this subject. But we do not accept it as the last word of science. Rather, as it appears to us, does it indicate that the method of transmission of the electric force by a continuous rail or overhead wire, as to which we have always had serious doubts, is not a step made in the true direction in which to seek for the solution of the problem of locomotion. What may be done by accumulated force, and the use of secondary batteries, is as yet almost unexplored. Nor do we hold it to be unlikely that the establishment of electric accumulators at proper distances, fed by a continuous current, but able to supply large power on instant demand, may prove to be the key to the problem. The total loss by transmission and reconversion of electric energy (while it may be less) Dr. Siemens thinks it safest to estimate, with Dr. Hopkinson, at 50 per cent. When, however, water-power, tidal force, or any other inexpensive motor is obtainable, the loss of 50 per cent. in transmission becomes comparatively unimportant. We have seen at how great a disadvantage the locomotive works, not only as to the delivery of its power, but also owing to the great weight of the engine itself, the proportionate addition to the weight of the rest of the rolling stock, and the consequent increase in the cost of the whole superstructure of the railway. As to this, Mr. Fowler, in his address to the mechanical section of the association, struck a new but perfectly distinct note, when he said that an ideal railway should have gradients of about one in twenty falling each way from the stations, with a piece of horizontal line connecting them. As to this, however, it must be remarked that such a section would involve a duplication of the entire railway system; the undulating arrangement being applicable to short stages, but altogether inappropriate to such long runs as that of the 186¾ miles from Leeds to London, accomplished a few months ago within three hours, or at a rate of more than sixty-two miles per hour. We may note here, in passing, as confirmatory of some recent remarks of our own, that Mr. Fowler has found that 60 per cent. of the whole power exerted by the engines on the Metropolitan Railway is absorbed by the brakes. This makes the cost of locomotive power for one mile on that line equal to the cost for two miles and a half in such a case as that above cited; and fits, as accurately as may be, with our own estimate of the cost of locomotion on the Metropolitan Railway, per ton mile of loaded train.

Passing from the consideration of the application of electricity to locomotion to that of the use of the same subtle and mighty agent as a stimulant to vegetation (though we thus reverse the order of the address), we find that there is little to be added to the statements of Dr. Siemens's paper on the subject read before Section A last year, to which we called attention at the time, with the exception of the prosecution of further experiments on the cereals. "Towards the end of February, with the first appearance of mild weather, the plants under the influence of an electric light of 4,000-candle power, placed about 5 mètres above the surface, developed with extreme rapidity, so that by the end of May they stood above 4 ft. high, with the ears in full bloom, while those not subjected to the rays of the electric light were under 2 ft. in height, and showed no signs of the ear." It is extraordinary that the statement, by a man who has given such hostages to science, of the action of this magical farmers' friend, has not attracted the efforts of the promoters of companies. It remains, of course, to be seen whether this wonderful quickening of the growth of the individual may be in any way produced at the cost of the race; and whether the seedlings, or the seedlings' seedlings, of electrically-grown wheat and barley would retain all the reproductive energy of wilder grasses. But when we reflect on the immense energy of tropical vegetation, we are inclined to think that the above fear, though by no means to be neglected without trial, may prove to be baseless. And, if so, what a future is before the agriculturist.

In another part of that wide and ample range which is so practically familiar to the President of the Association for the year, another of our frequent topics of discussion was dealt with in language almost identical with our own. Dr. Siemens looks to gas as the fuel of the future. A pound of gas, he told his audience, yields in combustion 22,000 heat units, or exactly double the heat produced in the combustion of a pound of ordinary coal. A pound of coal, however, it must be remembered, will only produce 0·16 lb. of gas, although the value of the by-products of distillation,—tar, coke, ammoniacal liquor, and, if only it were extracted, sulphur,—exceeds the cost of the coal used for gas-making by nearly 60 per cent. The cloudy canopy of London, Dr. Siemens states, on the estimate of Professor Roberts, contains in a winter's day 50 tons of soot; that is to say, of comminuted carbon, and five times that weight of carbonic oxide. The use of gas for all heating purposes, we hold with Dr. Siemens, is one of the promises of the future, the delay in the accomplishment of which is somewhat unaccountable; and we further agree that the distillation will probably hereafter be effected in the mine, the gas being sent by pipes from the bottom of the shaft, so that it would be only the tar, coke, and other by-products that would have to be raised mechanically through the shaft.

The triumphs which Dr. Siemens has already won over matter, in so many provinces of its wide-spread and diversified realm, have perhaps exposed him to the noble and unusual fault of being too ready to give credence to anticipations, more brilliant than solid, in departments less familiar to his footsteps. Thus, he says that the estimated cost of the Panama Canal is 20,000,000*l.*, and that more than this sum having been subscribed, it appears unlikely that political or climatic difficulties will stop M. de Lesseps in its speedy accomplishmeut. A communication lately made to the Société des Ingénieurs Civils, at Paris, by M. Hersent, one of the warmest supporters of M. de Lesseps, gives a very different outlook. Down to May last the clearance of timber and brushwood from about half the track of the projected canal is all that M. Hersent can point to in the way of preparation for actual working, with the exception of borings, soundings, the erection of sheds and hospitals, the purchase of materials, and other such-like preliminary work, involving the movement of a total quantity of earthwork equal to about the contents of a yard run of the deepest cutting shown on the section. Out of 287 Europeans despatched to Panama since January, 1881, "for the service of the survey and of the works," 39 per cent. were either dead or had fled the spot in thirteen months,—a numeric statement which fairly tallies with the last accounts of the desertion of the locality in troops by the intended labourers. And the estimated cost is not 20,000,000*l.*, but more than 40,000,000*l.* The capital of the company, as constituted, is 12,000,000*l.*, and half of it has been already called up. Nor, as far as we have seen, have any nautical men failed to ridicule the idea of the rival project of a ship railway, "to take the largest vessel, fully laden and equipped, from sea to sea, over a gigantic railway across the Isthmus of Tehuantepec, a distance of 95 miles." As to these matters, the civil engineer, the naval engineer, and the prudent man of business, alike shake their heads. Have we so far exhausted the practical that we should rush after the purely visionary?

The student of science suffers, on occasions like the present, under something of the *embarras des richesses*, when so many eminent men, within such narrow limits of time and of space, do their best to give a brilliant *résumé* of the condition of those branches of science with which they are severally most familiar. And it is a striking proof of the advance of science, and of the constant specialisation and sub-division to which that advance subjects the general conception, to find two such addresses as those of Dr. Siemens and Mr. Fowler, each dealing with pressing questions of the engineering of the day; each in itself full and lucid, and yet in no way overlapping one another.

The references made by Mr. Fowler to the Channel passage,—a matter to which he has long devoted special attention,—have much value at this time. It is due, not to any defect on the part of the naval engineer, but to the neglect of the harbour capabilities of the French coast, that the state of the steam ferry across the Channel is such as to allow the idea of the construction of a more costly, more dangerous, and far more personally disagreeable mode of communication to be even mentioned without a smile. To this great defect the French Government is now engaged in providing a remedy. Nor do we doubt that a few years will witness the provision of so swift, steady, and healthful a mode of steam ferry that very few persons would hesitate to use it in preference to a choky tunnel of twenty-eight miles long, were such a useless tube actually constructed. As to goods, the cost by sea is less than one-third of that possible by railway, even apart from the enormous dues that would be requisite to pay for the construction and maintenance of a tunnel.

In compensation for that increase of special knowledge to which we referred, as limiting the amount of information within the grasp of the individual student, we have, however, to note that rapid increase in the electric communication, so to speak, of thought between departments the most widely distinct, to which the general advance is, perhaps, mainly due. Thus the improvements in the manufacture of steel directly affect the prospects of navigation, and will not be unfelt in any branch of industry. And the humble investigations which have been undertaken in order to discover what are the best and the cheapest methods for illuminating

and for warming our houses, shops, factories, and streets, have sprung at one vast leap to the orb of the sun, and are now engaged on the problem whether the absorption of the actinic rays due to the energy of that mighty planetary centre occurs in the solar or in the terrestrial vicinity, or, as Captain Abney considers, "somewhere between the solar and the terrestrial atmospheres."

STRICTURES ON STORIES.

A STUDENT may sometimes not unremuneratively employ his time in devoting careful attention to a set of the most unsatisfactory compositions of a particular class that he can bring into comparison. An example which is purely repulsive in every respect will conduct to as little edification as delight when taken by itself, but when collated with another which has some redeeming characteristic, it brings this into relief and directs attention to the points at which nature, that most truly abhors vacuity of expression, is ready to develope beauty if art and reflection will only do justice to their share of responsibility. Such an opportunity is not wanting for those whose habitual route carries them through such streets as Gloucester-place or the Harley-street, of which the name recals the heiress of Queen Anne's minister. What flowers are to be found, what honey to be gathered, in this architectural wilderness, which seems almost too barren to root a weed? If we look out and ponder as we pass along, the walk may not be uninstructive. The original blankness has provoked some later protests, some struggles, however often futile and ill-directed, to obtain relief. After a few such courses of observation we may appreciate the seriousness, as regards architectural fitness and effect, of an omission which is all but universal in street after street, mile after mile, of domestic habitations in London, but chargeable also on many compositions which put themselves forward as studied and finished, as exemplars of elegant and even noble style.

When a dwelling has to be foregone altogether, or else run up in the most economical fashion which is consistent with stability and endurance as weathertight, there is no more to be said, but in cases where it appears that expense is lavished on internal spaciousness and decoration, while neither care nor expense has been bestowed to alleviate what must be an obtrusive hideousness for generations who have to pass the exterior, perforce, and cannot help seeing it, not only our artistic but our moral sensibilities rebel. The suggestion of the unsympathetic and unsociable is oppressive, and as justly to be resented, if it were worth while to give way to resentment, as the more actively offensive parade of vulgarity in overdone ornament. Many great mansions are there in the London bequeathed to us by our ancestors, which have all the characteristics within of noble mansions, but that are as bald and unrelieved without as any stretch of more moderate dwellings in Welbeck-street or Wimpole-street. Let us give attention to one point of failure which is common and more excusable here, but by its very undisguised grossness directs us to consider how far the same flaw is a drawback to the consistency and dignity of far more pretentious structures. What is in question is the incongruousness of false exterior indication of stories or omission of any such indication at all. It requires all our appreciation of the beauty of the composition to excuse the solecism, which has been justly pointed out in the Banqueting Hall of Inigo Jones, that what is one room internally is made to look on the exterior as if it were in two stories. Conversely, in the buildings which we are now concerned with, they might for anything that is shown exteriorly, consist of one single apartment from line of door-step to parapet. It is only in certain cases that balconies to the drawing-room windows give intermittent assurance of a floor-line; it is, again, only in certain cases that a flat band gives one indication of a line of floor somewhere above; in any case whether this is introduced below the windows of the second story, or the still higher story is left as too insignificant to be allowed such an acknowledgment, for anything that is shown by external sign two ranges of windows light a single story. It is true that we know very well that they do not; we are too familiar with the regulation interiors to require information on the point, to be misled by its failure. But the artistic purpose which underlies such indications is not in any case direct information, but indirect significance; an artist insists on an expressive feature not to solve a difficulty but to satisfy a sentiment. When the windows of the chief story have elaborate dressings and are crowned by pediments, as at Somerset House, they occasionally approach the small windows above them so nearly that these, comparatively insignificant as they are, do not suggest the thought of another story, but may possibly pass for mere upper lights of a colossal apartment. If this deception can really be made effectual, there is no doubt that a considerable degree of dignity is gained; but the gain, like other illicit gains, is at the cost of severe sacrifice in other directions, and, moreover, is precarious; it were better sought for by a more legitimate stratagem, which is not far to seek. It seems to be with some intention of adding dignity to a principal story by robbing that above it, that a line of mouldings, sometimes even approaching the importance of a cornice, is observed to be occasionally formed by a continuation of those of the sills of the upper windows. But "the stern avenger" of outraged equity "is behind"; and not far or long behind. The upper story accepts its acknowledgment as a story, as an individuality; but the exaggeration of its line of window-sill does not compensate for the entire suppression of its true line of floor. If the most strongly-pronounced line has a pretension to mean anything, it will tell as meaning that floor and sill are coincident, be the consequences to convenience what they may.

In the Strozzi Palace at Florence, where the sills of each of the upper stories are united by bold string-courses, these do really represent the lines of the floors, but from the height and dimensions of the windows it seems quite consistent that this should be so. Many of the palaces at Genoa give excellent examples of frank recognition of the division of stories by simple bands of progressively-graduated breadth according to height, with very slight projection. Suppression of this distinct intimation of condition of occupancy, involves forfeiture of a grace which is worth conserving, — the expressive gradation of dignities between various horizontal divisions of the structure. Of course, the gradation will not easily be graceful if graceful propriety does not exist in the characteristic purpose which ultimately dictates the application and distribution of space. If a mezzanine over a ground-floor is pinched to the dimensions of a loft, the best course to be taken is certainly to conceal the fact that it is a distinct story, if that be possible; the same course will recommend itself if attics are to be no better than cock-lofts. But architecture asks for better employment than taxing invention for schemes to mask the mean and the unbecoming, and to hide away vulgarity under an ill-fitted veneer of dignity and decorousness. The local habitations which it is its pleasure and privilege to provide are understood as required to harmonise with the circumstances and requirements of inmates of well-balanced dispositions and appreciative of consistency. In many of the Venetian palaces, while the ground-floor is manifestly given up to the utilitarian purposes, of the merchant princes, the *piano nobile* above it is scarcely distinguished in dignity, as in the Pesaro, from that above it; much of the charm of gradation is in consequence wanting; but no inconsistency is involved, inasmuch as the magnitude and splendour of the structure suggests that there must naturally and easily be quite ample secondary and subservient accommodation out of sight. But in too many Italian façades, not those of Palladio exclusively, there is a very harsh transition, indeed, from openings which are suggestive of airiness and magnificence to others close above or close below them of such depressed and confined proportions as to suggest not only contrasted condition of the respective inmates, but their inconsistent and unpleasant proximity.

The acceptance of the principle that stories are to be allowed expression exteriorly, by no means necessitates a frittering of effect. We have only more favourably at command the resource of harmonious gradation of forms and dimensions, and dignities. But gradations must be sufficiently distinct to pronounce themselves if monotony is to be avoided; and bold as they may on occasion be, they must not be overbold, must not be violent, if diversity is not to lapse into discord. The Italian palaces alluded to constantly offend by harsh conjunction of unduly contrasted features, even in compositions which contain so much that is admirable that a critic often finds himself hastening to overlook or forget such imperfections, and disposed to sacrifice conscience rather than spoil pleasure. But justice must take its course, and a just sense of harmony rebels against the intimate companionship of windows stately and elegant, with such openings as even the best Italian architects constantly ranged with them, and often below the same cornice. It may be that herein the architecture gave a true reflection of the habits of a society which strained resources to the utmost to vie in splendour of public receptions and festive assemblies, and submitted willingly to cramped accommodation in private apartments, and had no consideration at all for the miserably confined lodgings of dependents; but this agreement does not make the architecture any more worthy of imitation than is the society in respect of such deep-seated discords. The architectural discord is peculiarly offensive when associated windows are not only contrasted by meanness in dimensions and absence of ornament, but have the difference in form which is equivalent to a rude contradiction. We turn from one design of Palladio to another to be offended as by a wrench in progress from one window of the appropriate erect oblong form, to another above it, which shows as an oblong laid on its side, and sometimes of dimensions that would appear to reduce it to a peep-hole. Such a form would be disagreeable even for a window so large as manifestly to preclude apprehension of an inconvenient lowness of the apartment it pertained to. The unpleasantness is seriously aggravated when no indication of a line of floor sets us at rest as to the relative height of those who should look out of the window; but this is not the limit of aggravation, of compound aggravation; these objectionable forms of windows are sometimes inserted in an attic above an order, where they bring us near other suggestions of discomfort in the slope of a roof; or they are inserted incongruously in a frieze under a cornice. In the Library of St. Mark at Venice we have such flat openings, only with rounded corners, inserted in the frieze over an otherwise noble composition, and their form, dimensions, and position alike make us shrink from even a conjecture as to what may be their relation to apartments in the interior.

Harmonious gradation, therefore, in avoidance of violent, of screaming, contrasts in magnitudes or forms, must be studied if well-defined stories are to be effectively combined; and the skilful grouping of stories,—the indication of two or more as having some special relations,—is still another resource for conferring unity and concentration upon a design which, otherwise from limitation of its features, gives little scope for variety. The leading principle of such grouping must needs be the expressive indication of the immediate or remoter relations of different stories, whether in immediate sequence or not, in respect of dignity. The topmost story and basement may thus be shown as correlative and the others as connected. In a mansion, a residence of importance, where the urban restrictions of the ground-plan do not come into consideration, the problem is simplified, as offices and all appurtenant apartments can be kept out of sight or treated separately, and there is no need to consider how a park or garden front is to be kept in countenance under the incongruous intrusion of windows in a basement.

But when the conditions of a metropolis,—at least, such a metropolis as London,—are to be dealt with, the case is altered, whether the design of a moderate dwelling-house is in question or that of a noble mansion, a public office or a clubhouse. The ordinary dwelling-house presents the problem in its most frequent as in its typical aspect. The question of the architecture of flats is becoming urgent; but, for the present, an Englishman's house is his castle, or, as some have said, is his island, by mere continuation of the insular instincts of his geographical situation. And the domestic systems which animate these settlements are very uniform in general type, and their characteristics have tended to mould a material envelope on the same prevailing pattern. In place of moat or channel there is the defensive area, and this, when liberally spaced in large structures and screened by balustrade or solid parapet, gives an admirable base line; it also houses the offices in happy contrast to the ground-floors or basements of Italian palaces,

with their windows protected by repulsive grilles or openings recipient of all dust and ordure from the immediate common level of the roadway. The ground-floor is then raised so high as to frustrate prying inlook, provides hall and dining-room, study or library or business room, and handsome access to the floor above; here, in due light and elevation, come reception rooms and elegant retirements; above, again, are the superior bedrooms, baths, &c.; over these the domain of the young,—nurseries, schoolrooms, rooms for piano practice; and, lastly, over all, the rooms of the female servants, and space to spare.

How, then, shall systems of stories such as these prove susceptible of grouping exteriorly with propriety and effect? A gradation in heights is naturally suggested by successive purposes; the true difficulty seems always to be encountered in the management of the topmost, but in truth the least esteemed, story. Yet, least esteemed as it may be, it is in possession of a place which of necessity brings it conspicuously into evidence. Constantly we find it so treated as if only tolerated at all under compulsion, and making itself all the more obtrusively offensive, as if resentful of such treatment. Who can look up at Hope House, in Piccadilly, and not commiserate the architect who found himself obliged to stack a garret upon an attic, which gave him a conclusion on which he would so willingly have paused once for all. There seems no more helpful solution for the difficulty than to summon heart of grace, and resolve to treat the topmost story handsomely; to smooth the transition from the story below it by not admitting too great a difference between them, and so attain to that compromise so dear to diplomacy,—a practicable *modus vivendi*. This will certainly be in favour of a certain humaneness of style; expense may be increased, but we are only dealing now with cases in which it will be compensation for some extra expense that a treatment is avoided which shall suggest that as the work came to an end, resolution which had so far sustained expenditure lost heart, and hurried to conclusion as best it might, even though bad might be the best. Architectural style merits most cordial approbation when it succeeds in a combination like that which the Roman critic held to be characteristic of the happiest literary style:—

> "The happy point by him was hit,
> Who mix'd utility with wit."

But too true it is that internal convenience and external grace are seen all around us scowling at each other as natural enemies, and we have to stand by, distressed friends of both parties, as they fight the quarrel out; in many of such streets as we have alluded to, gracefulness seems fairly beaten out of the field; at most it makes some show of asserting itself about the doorway as if to leave a protest behind while effecting escape after endurance of disrespect no longer tolerable. Elsewhere with somewhat of the overbearing violence natural after such provocation, it shows itself as inconsiderate of the claims of a competitor who should be its sympathetic ally. In the symmetrically designed ranges of houses in the Regent's Park rejoicing in all the freshness of triennial paint, ornamental architecture has its own way without restriction, and arches and arcades, porticos, pilasters, and cornices make the most of their opportunity, let those who seek comfort and convenience behind them murmur as they may. Again, the chief suffering falls to the lot of the unfortunate upper stories. The order attached to the façade finds it necessary to its dignity to push up its cornice beyond the level of their floors, and up to the line of their window-sills,—a cornice with such a projection as to cut off all view of the Park from the windows, if, indeed, the windows also were not in many instances forced up to such a height from the floor that outlook in any case would be inconvenient. But it is in these and the like cases that the conflict of the powers is, in fact, internecine,—is mutually destructive; for fatal to the true dignity of the exterior aspect is the betrayal by the only half-hidden deformities of windows peering over the edges of parapets or peeping between balustrades, of the tyrannous clumsiness by which the victory, such as it is, has been achieved.

If this objectionable result is recognised, but the contest is still to be sustained under the conditions of maintaining a certain theory of dignity at any cost, there remains an even more desperate expedient. This troublesome story, inevitably topmost in position, while in purpose and suggestive associations inferior and subordinate, has to be hustled out of sight. The wall of the front shall not be pierced to give it light by windows so small and of such depressed proportions as to be significant of meanness, or by any windows at all; but it shall be raised so as to mask, and, indeed, to imply disallowance of the existence of, any such story, which still can receive light behind it by unseen skylights. This is a stratagem which has found favour with the designers of some club-houses of very imposing character. The difficulty which it should then be incumbent upon a designer to surmount, but which it must be said he too often takes the liberty magnificently to ignore, is in what manner to suggest to the spectator any reasonable explanation of the excessive height of blind wall above the highest visible windows of what exhibits itself as the uppermost story. In stately Italian palaces it is consistent that the proportion of blank wall above a window should be large, and the top of the window proportionately nearer the floor; so is the requirement of welcome shade conciliated with sufficiency of light; but in our northern latitude that light is most valuable which enters near the level of the ceiling, and a blank space which inevitably is taken to imply a large interval from ceiling to window, carries the suggestion of the cavernous, of oppressive and uneasy gloom within. Little relief is given by an attempt to produce animating play and variety by a deep cornice with overcharged mouldings, or a frieze below it enriched with festoons and emblems. This is one of the cases in which cumbrousness of apology only attracts attention to the seriousness for the need of excuse.

The existence of the suppressed story is at last only imperfectly, indeed often only carelessly, masked, and one hint of dishonesty shakes faith more extensively. A suspicion will intrude that the magnificently-distributed façade is, in fact, but a jacket, so to speak, and an ill-fitting jacket. May we not be looking at what is, in fact, but an ornamental box, within which conveniences may be stowed away, ingeniously enough for economy of space and in positions where the owners by familiarity can lay their hands upon them, but positions scantily expressed by the external ornament, contents having as little organic connexion with their envelop as the anatomy of a hermit crab with the shell which it casually appropriates?

The battle of life, it is true, is not to be carried on and carried through without certain compromises, and the conflicts involved in the practice of architectural design are episodes in the general battle, and participate in its conditions. Mere blunt conscientious intentions will not be a sufficient guide in either case. Neither life nor architecture is so simple that we can find our way through their difficulties by only meaning well. The artistic sense, like the moral sense, has to be sharpened by reflection, and cultivated by exercise, and refined by observation of examples, by reverential attention to spontaneous promptings, that do not at once explain themselves. It is in such promptings that imagination often volunteers good aid to studious invention, and so is cleared many a problem quite as intricate as the detection in a complex of requirements for convenience, of a scheme which, while subordinating the lower, makes it conduce by harmonious contrast to the special dignity of the lofty, and achieves appropriate characteristic expression by the peculiar terms of their association.

THE ART OF THE CALIPHS.

IN what has come to be understood as the existing "art movement," not one of the least important factors may undoubtedly be said to have been the influence of the art of the East, as it has been revealed to us since the Great Exhibition of 1851; and not alone the art of Japan, of China, of Turkey, and of India, but the art of Persia, of Egypt, of Algiers, and Moorish Spain, has found its admirers among the most refined of our leaders in matters of taste. Japan, we may say, has already begun somewhat to pall upon the public, in spite of its wonderful and brilliant products; but the art of Persia, the art of the Moors,—in a word, the art of the Caliphs,—ever since the day that Algeria was conquered by the French half a century ago, and the contemporary romantic poets and painters sang and pictured the beauties of the Alhambra and the dreams of the land of the Arabian Nights, has had among the refined its passionate admirers in England and in France. Its delicate products, its choice and exquisite illuminated manuscripts; its filmy, fairy-like, and gorgeous fabrics and tissues; its embroideries and rugs, which the painters ever since the Renaissance have admired; its finely-tempered arms; its patiently-elaborated damascened caskets; its brilliant pottery, have peculiarly appealed at all times to the artistic temperament. Among the great periods of art, that of the Mussulman caliphs of the East and West now takes its place as not the least brilliant in artistic history; the art which the descendants of the simple shepherd Arabs who rallied round Mahomet developed from their contact with the peoples whom they conquered, and whom they found living amidst the relics of a brilliant past civilisation.

When Mahomet died, A.D. 622, the direction of his growing empire, left without a head, fell to the care of Abou-Beker, the father of the prophet's favourite wife Ayesha. On assuming the supreme authority Abou-Beker refused to take the title of king or prince, contenting himself with the modest title of caliph or "successor," a title borne to the present day by the Sultans of Turkey. As the Mussulman empire extended further and further before the conquering armies of the Moslems, the power was sub-divided into several caliphates, of which the three principal were those of the East, settled at Bagdad, to which it had been moved from Mecca; that of Spain, settled at Cordova; and that of Egypt, at Cairo. Under these rulers the Mussulman empire was in a short century extended from India to Spain. Contemporaneously with their power was developed an art with the beauties of which all persons of refinement are familiar, but of the elements, the details, the variations and successive creations of which we are still but imperfectly informed. The most brilliant productions of this art of the caliphs we have been taught to seek in Spain, where Cordova will always remain, with its picturesque Moorish battlements, "the city of the Caliphs," and where the Alhambra will for many a generation to come fulfil the traveller's utmost dream of all that he may have read and pictured of Oriental splendour.

But if we turn to the Arab art to be found in countries like Syria and Egypt, where the influences brought to bear on its development varied so completely from those of Spain, a great difference will be seen existing between the art of the Arabs proper and the Moors of the West,—between the art of the caliphs of the East and that of the caliphs of the West.

With the Moorish architecture and art generally the artistic world has long since been made familiar, and though it may be said that there it was that the art of the caliphs flourished in its greatest brilliancy, yet it must be remembered that in Egypt and Syria also the caliphs exercised their power. Damascus, Aleppo, Bagdad, and Cairo were cities in which the artistic tastes of the caliphs of the great days of Moslem power were exercised, and which, to this day, bear the evidence of their magnificence. For us, however, at the present moment, the Caliphate of Egypt possesses the most interest; it is it with which we are now daily brought into contact, and the threatened fate of the brilliant capital, Cairo, the second city in importance in the Mussulman empire, has not unjustly roused the warmest fears of the artistic world.

We possess but few authorities respecting the subject of the art of the caliphs, the works in existence are chiefly of an illustrative character. In a previous paper on the art of the Arabs mention was made of M. Bourgoin's "Arts Arabes"; it consists, however, of but a few pages of text, the rest being composed of a valuable and elaborate series of drawings and studies of the geometric principles of Arabic art; the same may be said of M. Coste's work, previously referred to, and of Hay's "Views in Cairo." Girault de Prangey's works, published now hard on forty years since, still remain invaluable for purposes of study, the use of "the admirable instrument invented by M. Daguerre," to which the author makes reference, rendering the illustrations unimpeachable for their accuracy. But the letterpress is scanty; it is only on the Arab art of Spain that De Prangey is discursive. Information, in fact, is still sadly wanting on the subject, and a field lies open for much interesting and attractive study. As one of the results attendant on our present action in

Egypt, we may not unreasonably look forward to fresh acquisitions made in our limited acquaintance with the art of the Egyptian caliphs.

With the brilliancy of its creations, travel and our museums have of late years rendered the inquiring public comparatively familiar; but we as yet form only a very scant idea of the splendour and refinement of the life of the caliphs who opposed our hardy Crusaders. It would, indeed, be difficult to imagine a greater contrast than that offered by the existence led by the Orientals and that of the sturdy English, French, and German warriors who, in the deepest twilight of the Dark Ages, sallied forth from their gloomy fortress homes and rough castle life to break in upon the no less brave and warlike but refined Infidels. In the history of Western art and civilisation, the influence exercised by the Crusaders is well known, the result of the contact of our boisterous warriors with the cultivated and artistic Easterns.

The refinement in which they lived was indeed ideal, and the art of the caliphs all that the "Arabian Nights" have ever pictured to the mind of the most romantic. When we see the grandiose mosques which still stand in all their ruined beauty, to attest the magnificence of their builders, we can understand that there is no exaggeration in the stories of the historians of the artistic splendour of the caliphs who opposed our steel-clad "Red Cross Knight." Accustomed as we have become to the luxuries of our modern civilisation, our eyes feasted in museum after museum, in exhibition after exhibition, with the creations of the art of every land from the most ancient times, we can still scarcely picture to ourselves such rareties of decorative splendour as those which filled the palace of the caliph of Cairo, Mostanser, the father of Mostaali, from whom, never let it be forgotten, Jerusalem was taken by Godefroy de Bouillon in the last year of the stirring eleventh century. We have, in the pages of the Arab historian, Makrisi, the very curious and detailed relation of the pillage by his discontented Turkish officers of the caliph's palace at Cairo. The account, perhaps for the first time brought before English readers, gives us some idea of the art of the caliphs of this brilliant period of Arab history.*

Never, it would seem, was life more tormented than that of the Egyptian caliph Mostanser. Attacked in his palace by his own guards, like Job, he found himself reduced to the extremest misery. The priceless treasures of the palace, collected year by year for generations previously, he saw scattered among his mutinous officers and servants. The jewellers called in to value the contents of the treasury could only assure the pillagers that such objects as they were called upon to appraise were beyond all monetary value. We are told of bushels of pearls, 1,200 rings of gold and silver, ornamented with precious stones of every species and colour, all heirlooms; caskets of gems which, the jewellers assured the officers, it was impossible to value, they were such as could alone be owned by princes. One casket Makrisi mentions as full of vases of the purest rock crystal, and other caskets filled with vases of precious metals. Numerous other choice objects of crystal are cited by the historian, who refers to a large number of enamelled plates of gold; 9,000 caskets of different forms, lined with silk and enriched with gold, each the case of crystal and other goblets; more than 100 cups of bezoar, on which were engraved the name of the Caliph Haroun al Raschid,—this shows their age, the caliph being the contemporary of Charlemagne, ninth century; coffers filled with poignards of gold and silver gilt, with handles of precious stones; innumerable inkstands, round, square, large, and small, of gold and silver, sandal and aloe wood, of ebony and ivory, enriched with precious stones, and remarkable for their perfection and elegance; coffers filled with cups of gold and silver, of every size and of the most perfect work; a multitude of porcelain jars of every colour, full of camphor; cups made of amber from Schahar; bladders of musk from Thibet, and aloe-wood closets full of furniture; huge basins for washing purposes, each supported by feet representing animals, and all of immense value; a multitude of cages filled with porcelain; a golden mat on which had been married the caliph Mamoun; twenty-eight plates of enamel enriched with gold, a present from the Greek emperor. An immense number of coffers filled with mirrors of steel, porcelain, and glass, all enriched with filigree of gold and silver, and bordered with precious stones, the handles of cornelian and other gems, and contained in cases of velvet and silk of gorgeous patterns, all fitted with locks of gold and silver; a large number of parasols, the canes of which were of gold and silver; nearly a thousand utensils of silver enriched with gold, to which the fineness of the work and beauty of the chasing gave an additional value. Numbers of chess-boards of silk, embroidered in gold; the "pieces" of ebony, gold, silver, and precious stones; 400 large cages of gold filled with jewels of every sort. Furniture of silver of great weight; 4,000 golden vessels for narcissus flowers to be placed in, and 2,000 others for violets; 36,000 pieces of crystal; 22,000 figures of amber of great weight, innumerable figures of camphor; 800 pieces representing melons; a turban enriched with stones,—one of the most curious and precious objects in the palace. From the perfume store was taken a quantity of Indian aloe-wood, pieces of camphor and amber of great weight; a buffet, of porcelain, of immense size; a rare crystal box; a golden peacock enriched with the most precious stones, its eyes of rubies, its feathers of gold enamelled with all the colours of the original; a cock of the same metal, with a crest of rubies of great size; a gazelle, the body covered with precious stones, its belly white, a tissue of pearls of great value; a piece of amber in the shape of a lamb; a melon of camphor of immense weight contained in a golden net enriched with stones; another, in a golden box of immense weight; an egg of rubies of immense weight; a crystal basin; a table of sardonyx, large enough for several people to sit at; a golden date-palm tree of inestimable value, in a golden case, the fruit of precious stones representing the date in all the degrees of its maturity; a gondola, with its flags and carpets complete, made for the Vizier Ahmed, and for which an immense sum had been paid for work alone, apart from the material; thirty-six other gondolas are mentioned, which served for the court, all richly carpeted; a garden, the soil of which was of chased silver gilt, the earth of amber, the trees of silver, the fruits of amber and other precious materials, the whole of immense weight. More than 50,000 pieces of Damask are spoken of, all enriched with gold; carpets, which had never been used, are mentioned as having been in thousands, some of red damask enriched with gold and of the most exquisite work, reprerenting parks and elephants. From the wardrobes were dragged 3,000 pieces of red damask; a number of tents completely furnished with sofas, tiles, cushions, carpets, and curtains; tapestries of the greatest value; silk tissues; mats of gold and silver, adorned with elephants, birds, and other animals, some with portraits of former caliphs, one with a map of the empire, very old and of immense value; a tent of red satin woven with gold made for the caliph Montawakel. The palace of the caliph Mostanser contained, in addition, a prodigious number of arms, swords, lances, and cuirasses of every kind, many of them historical weapons; harness enriched with gold and silver and stones; bundles of pikes, 200,000 pieces of armour, all of the richest kind; hundreds of bucklers and standards of gold and silver, and trappings of incredible value gathered together since the foundation of the palace in the previous century. The whole of the armoury was, it would appear, reduced to ashes through the carelessness of a servant. Among the treasures lost were a number of tents of immense value, some described minutely as gorgeously decorated with woven and embroidered animals, peacocks, &c., in China silk of every colour, and all accompanied with their fittings. Some of these tents were so vast as to require twenty camels to transport them from place to place. The pole of one tent, "the great rotunda," was of silver and gold, and was no less than 65 cubits in height; the tent, 6 cubits in diameter, and 20 cubits round. It was formed of sixty-four pieces of stuff; 100 camels were required to move it. All the interior was adorned with embroidered figures of great beauty. It is worthy of remark that the tent was fitted with a very large ventilator. In the making of the tent no less than 150 workmen had been employed during nine consecutive years. Many other tents are mentioned, one as requiring 200 men to set up. We must postpone, however, what we have to say further.

* We owe this information to research in a somewhat out-of-the-way source, the "Mémoires sur l'Egypte," by M. Etienne Quatremère, Paris, 1811.

COLCHESTER CASTLE.*

CONSIDERING that a century and a half has passed by since Morant wrote his "History of Essex," and of Colchester Castle, and that no more modern historian duly qualified for the task, if we except Mr. Buckler, has entered the field since his day, it is certainly time that publicity should be given to the results of the long and frequent scrutiny to which archæologists and antiquaries of late have subjected that most interesting fabric. It is not too much to say that, thanks to the summer congresses of our chief archæological societies, and to the interest in such studies which has been fostered by local associations during the last thirty or forty years, new light has been thrown upon many such relics of antiquity, and a new life has been in many cases given to their existence.

This is especially true of Colchester Castle, which, though long since deprived of its upper story, and called even by Camden in his day a "ruin," still frowns over the north-eastern portion of that town, which once was a rival to London, and the capital of a kingdom, or, at all events, of a province, and sixteen or seventeen centuries ago the head-quarters of the Roman eagles in Britain.

The writer of the work before us, who, unfortunately, is anonymous, has spared no pains to get at the bottom of the real history both of Colchester and of its castle; and in so doing he has been allowed by Mr. Jas. Round, the owner of the castle and its demesnes, to examine all such documents as contain authentic information about its early history. Some of these were unknown to Morant; and on others much additional light has been thrown by the deeper study of the early history of this country, which has marked the second half of the nineteenth century.

There can be now no doubt, since Roman coins and sculpture have been found *in loco* in sufficient quantities to prove it, that the whole of the plateau occupied by Colchester and its western suburb of Lexden formed the site of the Camoludunum of Imperial Rome. On the north and east this site was strengthened by the Colne, then probably a larger river than now; whilst on the south ran a smaller stream,—still called the Roman river,—which was fringed on the other side by a forest. These streams formed the peninsula on which Camoludunum stood; and it is possible, as hinted by our author, that Lexden was the actual residence of Cunobelin.

That such a position should have been chosen as the station of several Roman cohorts, and the residence of their commander, was almost a necessity where the choice was so limited; and accordingly we find that Claudius, when he entered Britain in triumph, founded here that huge encampment, the outlines of which are probably still roughly preserved in the plan of the existing streets of Colchester. From and after the date of this invasion, the Roman Colonia, named Camoludunum, sprang into being among the conquered Trinobantes. There afterwards rose a heathen temple in honour of the deified Claudius; and here, after the temporary outburst of British spirit in the person of Boadicea, the city was refounded, and its walls were built more strongly than before, in such a way as to have lasted down to the present day. In fact, it is doubtful whether, except at Lincoln and at Chester, more perfect specimens of Roman buildings remain than the present walls of Colchester.

But what about the castle itself? There have not been wanting those who have rashly concluded that it is also a Roman structure, and that in looking on its walls, as they now stand, they are looking on an edifice which was reared in the days of Imperial Rome. The writer of the work before us has brought forward only to demolish the theory of the late Rev. Henry Jenkins, who thought that the castle is a temple erected in the earliest ages of history to the memory, or in honour, of the Emperor Claudius; and there are others who have fallen in with the view. All this, and much more of the same kind of theories, might very easily have been broached and have found supporters in the days when every round arch which the Normans built in England passed for "Saxon," and when the first principles of architecture, whether ecclesiastical or secular, had to be worked out anew, as the Anglo-Saxon grammar has been worked out during the last quarter of a century.

* "The History and Antiquities of Colchester Castle." Colchester: Benham & Co. 1882.

The writer sees little or no reason for believing the legend which identifies Colchester with the birthplace of Constantine the Great; but he seems more disposed to accept the tradition that the Arthur of Camelot may have had more to do with Camoludunum than is generally supposed. If so, the prosaic Essex must put in a rival claim to the poetic region of Cornwall. "Does not Arthur himself tell us, with characteristic contempt for history," our author asks, "I have understood that *Belinus* and Brennius, knights of Britain, held the Roman Empire in their hands for many days, and also *Constantine*, the *son of Helen*, which is open evidence, not only that we owe Rome no tribute, but that I, *being descended from them*, may, of right, myself claim the Empire?' Is it, then," he continues, "too much to ask, that when, in the Laureate's Vision, we see

'The river, winding clearly,
Down to tower'd Camelot,'

we may be suffered to roam in fancy to the mystical birthplace of Constantine, to that 'Royal seat' of the great Cunobelin, which arose by the waters of the Colne?"

Those, however, who have seen, and have carefully examined the castle of Colchester, with every wish to accept the legendary story, can find nothing in the fabric to justify a supposition that in its present shape it had any existence before the Norman Conquest. Camden, writing in the reign of Elizabeth, observes that "historians report it to have been built by Edward, son to Alfred, when he repaired Colchester." Norden, the Essex topographer, writes, about the same time, as follows:—"Colchester, in the times of Saxons, was much battered and ruined by the wars of the Danes. Edward the Elder repaired it, and built a strong castle in it, of which there are still some remains, but ruined almost with age." Speed also attributes it to Edward. Later historians, however, such as Dugdale and Morant,—the latter basing his authority mainly on documentary evidence,—assert that the castle is of Norman origin, and that it was "built by Eudo Dapifer, upon the remains of King Coel's Palace."

The more that we examine in detail the configuration of Colchester Castle, the more closely shall we see it to resemble that of the keep, or White Tower, of the Tower of London, with this exception, that in its area it is nearly double the size of the latter. The keep of Colchester Castle,—for this is in reality all that is now visible above ground,—is a huge, oblong structure, about 152 ft. by 111 ft. square, whereas that of the Tower of London is only 116 ft. by 96 ft. The general arrangement was similar in both, namely, a basement, which was used for cellarage or storage; a first floor, which served as quarters for the garrison; a second floor, which was the principal one, for the state apartments; and a fourth, or attic story, which was used as a kind of fighting deck. This arrangement remains perfect in the Tower of London, but at Colchester, the two topmost floors have all but disappeared. Both buildings are similar with regard to the arching of the loops, their tortuous and intricate communications, and in the absence of fore-buildings. Each is entered in precisely the same peculiar manner; in each there is one, and only one, large newel staircase, leading from the floor to the summit, and in each there are similar large apartments; the windows, formed in the same manner, are similarly situated, and each possesses a general similarity of plan. "In short," as our author remarks, "to recur to Dr. Stukeley's opinion, 'they are works of the same time and manner, and probably of the same hand.'"

It may be said, however, that all along the best antiquaries, Morant included, have looked upon Colchester Castle as a Norman structure. But these persons have too readily taken upon trust the statement that its erection was the work of Eudo Dapifer, under William Rufus. Mr. Freeman, in a later edition of his "Norman Conquest" (1877), has gone so far as to accept the above statement, for, side by side with Eudo's authentic foundation, the tradition of his building the castle has been allowed to creep in. He writes: "The house of Rye rose high in William's favour. One son, Robert, became Bishop of Leez, and another, Eudo, the king's *dapifer* and Sheriff of Essex, founder of the house of St. John, at Colchester, *and, in all likelihood, builder of the neighbouring castle, vastest of Norman donjons.*" The writer of the present work, however, shows good reasons for holding, in spite of such tradition, that the Castle of Colchester was the work, not of a subject, but of a king, and that the king who erected it was the Conqueror himself. "Not only does the architecture, when rightly understood," he writes, "itself bear witness in our favour; not only have we definite proof that in 1091, at any rate, the castle was already standing, but we should also infer the fact from the very history of William's reign. 'Most of the castles whose foundation is distinctly recorded, naturally belong to places which came into William's hands in the course of later warfare. But there were castles in southern and eastern England also; and it is most likely that their foundation at least, if not their completion, was among the very first works of William's reign. In one case, indeed, we have distinct evidence of the fact. The borough of Norwich .... stood at no great distance from the sea which separated, or rather united, England and Denmark .... Norwich was, therefore, a point which called for special attention .... A fortress was therefore built within the walls of the city.' (Freeman's "Norman Conquest.") Now it is obvious that this argument would apply with even greater force to Colchester. A town of importance, both from its size and its fortified position, it stood at the head of a great estuary, and was thus peculiarly exposed to the danger of Scandinavian invasion. Its capture by the Danes would have been a serious blow to William, and it is absolutely certain that he must have hastened to strengthen it with a fortress. If a warning was needed to convince him of the danger, it was afforded in 1069 by the Danish raid up the valley of the Stour. But though a temporary building must have been thus early erected, the existing fortress was a work of his later years. I venture to think that we may safely assign its erection to the period between the accession and the invasion of St. Cnut, that is, between the years 1080 and 1085. At no time during the reigns of the Conqueror and his sons was the danger so great to the east coast, and the need of its defence so urgent."

The history of the castle from and after the days of our Norman sovereigns may be very briefly stated. During the revolt of the barons against King John it was alternately in the hands of the rival armies. It was captured by Prince Louis, the Dauphin of France, in 1217, but was retaken in the following year. In the reigns of Mary and Elizabeth alike its gloomy chambers and dungeons had to serve as a prison for many who were condemned to suffer for "conscience sake," both Protestants and Catholics.

Under the brief rule of Cromwell the fair town of Colchester, with its large intermixture of foreign Protestant settlers and its traditional hatred of ecclesiastical persecution, formed one of the strongholds of the Parliamentarian party. Its castle, however, from its situation and its ruinous condition alike was rendered of no account in the military history of the siege. History tells us how the gallant and loyal officers, Sir Charles Lucas and Sir George Lisle, were shot by Fairfax, under orders of a council of war, beneath the walls of the castle. For a century and a half, at least, after that date Colchester Castle seems to have done duty chiefly as a prison, and to have accommodated within its gloomy walls almost as many quakers as Wisbech Castle received of Roman Catholic priests.

In the last century a large part of the northern wall was demolished by a Mr. Wheely, who also destroyed the well and caused much other havoc, which, had it proceeded, might have left but little of the building standing; but, happily, about the middle of the last century, the fabric and the adjoining lands were purchased by an enthusiastic antiquary, Mr. Charles Gray, M.P., who, in his turn, bequeathed them to the Rounds, a family in whom taste and reverence would seem to be hereditary, and who have taken good care that, so far as it is in the power of man to do so, the progress of decay shall be arrested.

Westerdale, Yorkshire.—On Sunday last an oak reredos, erected in the parish church of Westerdale to the memory of the late Hon. Col. O. Duncombe (the gift of the family), was unveiled in the presence of a large congregation. The work was executed from the design of Messrs. Perkin & Bulmer, architects, of Leeds, by Mr. J. W. Appleyard, also of Leeds.

THE ARCHITECTURAL ASSOCIATION EXCURSION.

THE thirteenth annual excursion did not carry the members far from London,—Kettering being the head-quarters, and Oakham, which was reached thence by railway, being the furthest point. The London members of the Association are apt to look upon London as the point to measure from,—but do not quite take in the situation when they do so,—for an excursion, just at home like this last, made some of the excursionists travel about 600 miles, in straight travelling, out and home again. More than half of those taking part this year came from country towns and from Ireland. Mr. E. G. Hayes, the president of the Association, took the chair at all meetings, generally guided the party, and represented the Association officially. When the time came for thanking the officers, Mr. C. R. Pink, who has been the active excursion secretary so many years, received due honour; as also Mr. J. A. Gotch, of Kettering and London, who had furnished local knowledge and taken a good deal of pains. Some of the buildings were described by Mr. James Fowler, of Louth. We subjoin some notes partly taken from an intelligent account of the excursion written by one of the party, and printed in the *Northampton Herald*. This will give our readers a general idea of the district and the visits. Some notes on a few of the more interesting topics will appear in a future number of the *Builder*.

The objects of the excursion being more architectural than archæological, and the search being rather for beauty than mere antiquity, the most ancient remains in the county were passed over in favour of work of the Middle Ages and the Renaissance. On the first day the excursion started for Oakham. Here the fine church was visited, very thoroughly restored by Sir G. G. Scott; and thereafter the Castle Hall,—the most perfect Norman banqueting-hall existing. The building consists of what may be termed a nave and two aisles, and the uninitiated might well be forgiven if they thought themselves inside an ancient church. But it never was a church. In those days there was no sharply-defined style applied exclusively to churches, while a totally different one was employed for houses. All were built with similar details, varying according to the use to which they were put. The principal reason why we are accustomed to regard Gothic architecture as essentially ecclesiastical is that most of the houses in which it was employed have perished, whereas the churches have escaped. The carving here is especially fine, and includes what is said to be a portrait of Henry II., in whose reign the hall was built; but as another contemporary carving is said to be James I., these assertions must be taken for what they are worth. At Burley-on-the-Hill a short stay was made to enjoy the magnificent prospect, and take notice of the plan of the house and its colonnades. Exton Hall, the seat of Lord Gainsborough, was next on the programme, and the picturesque ruin of what was once a very fine Elizabethan hall received the attention it deserved, as well as the finely-treated tower of the church, with its characteristic spire-capped lantern. The church was restored by Mr. Pearson some thirty years since. A long drive over the Rutland hills brought the party to Lyddington, where a mad onslaught was made (metaphorically speaking) on the Bede House. This is one of the most interesting buildings in the neighbourhood, abounds in picturesque groupings, and has carved cornices, some very fine stained glass, and other magnificence. It must not be supposed that all these glories were originally lavished on the poor. The place was once a bishop's palace, but becoming the property of a private individual in the sixteenth or early seventeenth century, it was converted into a bede house; and very few bedesmen are so handsomely lodged as those at Lyddington.

The next day (Tuesday) saw the party off in carriages, starting from the Royal Hotel at Kettering, the very comfortable head-quarters of the excursion, to Loddington, where the church and the Manor House claimed attention. The church is a remarkably fine one for so small a village, and adds a very elegant example to the spires for which the county is famous. The hall is, however, even more interesting than the church, inasmuch as it has come down to us unmodernised in plan, and one can see at

this day just the arrangements which satisfied a squire from the reign of Henry VII. to the middle of last century. The western wing is the earliest in date, and contains a fine open fireplace and cellars. The rest of the house dates from Elizabeth's reign, when nearly every house in the kingdom was improved, and many were newly built. The entrance-hall is surrounded with ancient panelling, where the difference between the way of working in Elizabeth's time and Charles II.'s may be seen at a glance. From Loddington the party went to Rothwell (called generally Rowell), where the rambling old church, which contains examples of work of almost all dates, and Tresham's delightful Market-house, occupied much attention. The church here is the largest in the neighbourhood, being as wide as Kettering Church, and considerably longer. The Market-house is a silent witness to the misfortunes of its author, the most ingenious man the county has produced. The Manor-house was admired for its door and staircase, but at the date when this house was built architecture had already commenced the rapid decline which brought it to the bottomless pit of early nineteenth-century work. Of its style, however, the doorway at the Manor-house is a very good specimen, and does considerable credit to its builder, the celebrated Serjeant Hill. From Rothwell a drive by Stoke Albany, where the remains of the Manor-house were inspected, and the very perfect details carefully sketched and measured, and by Wilbarston, whose dilapidated church struck melancholy into the hearts of the visitors, brought the party back to Kettering.

On Wednesday Warkton Church and the remarkable monuments of the Montagues by Roubiliac (about 1750) and Peter Matthias Vangelder (1781) were visited, and then Weekley, with its charming village-green lying between the hospital, the church, and the great trees of Boughton Park. No village can vie with Weekley in the delightful calm of its green, where the ancient bedesmen "grow old with the silent years," as the motto over their door has it, and endeavour, as far as changed circumstances will permit, to follow out the quaint rules laid down for their guidance by the Sir Edward Montague who founded their house 270 years ago. From Weekley, a walk through the park and past Boughton House led to Geddington, where the church, the cross, and the ancient bridge justified well a stay of some two hours. After Newton, with its pretty little church, and the Dove-house,—the only relic of the once extensive mansion of the younger branch of the Treshams,—came the great visit of the day,—to Rushton Hall. It would occupy columns to describe the Hall, which is one of the most impressive pieces of Elizabethan architecture in the country. It has not the picturesque variety of Drayton and Rockingham, nor the elaborate detail of Kirby; its attraction consists in its simplicity and quiet dignity, chiefly arising from the fact that the original design was adhered to by the successive builders. The main bulk of the mansion would seem to have been begun by the grandfather or great-grandfather of that Sir Thomas Tresham who will always occupy a prominent place in the memory, if only for his taste for quaint and symbolical building. The author of the Triangular Lodge and Rothwell Market-house left his mark on his ancestral home as well, and when he died, and the estate passed from his son, in consequence of his complicity in the Gunpowder Plot, the Cokaynes, who purchased Rushton, completed what the Treshams left unfinished. Scarcely less interesting than the house are the beautiful grounds, in whose alleys Dryden walked and wrote "The Hind and the Panther." In a distant corner of the grounds stands the Triangular Lodge, the only building of Sir Thomas Tresham's which is known to have been completed, and which, thanks to the care of its owner, Mr. Clark Thornhill, is in admirable condition. The Lodge is a mass of symbolism, apparently preaching in stone the mystic doctrine of the Trinity. Some of the numbers still defy all attempts at elucidation. It is illustrated pretty fully in a very early volume of the *Builder*.

The next day Drayton was the first place visited. In associations Drayton is in no way inferior to Rushton and its gardens, with their green lawns, clipped yew-walks, "berceaux and cabinets de verdure," and bright parterres, are alone worth a long journey to see. The house itself dates from the times when an Englishman's house was in very truth his castle, and from that time to this its checkered history is told by the jumble of styles in which the work is executed. Drayton has never been sold nor alienated, but by marriage it has passed through many hands, and every hand has left its mark. The mass of the walls is probably of the time of the Edwards; the windows, doors, chimney-pieces, and other features by which the date of a structure is most easily determined, are nearly all due to extensive alterations during the reign of William III. One wing is entirely Elizabethan, from its splendid vaulted cellars, where mighty barrels of beer stand in cobwebs and fungus, up to the chimneys, which recall Kirby. But here, too, alterations have been made, and the long gallery at top with one side furnished with ancient volumes, looks as if Lady Betty Germaine might have left it only a few months instead of a century. Lady Betty was Horace Walpole's friend, and she received Drayton from her husband, who in his turn had received it from his first wife, the last of the Mordaunts, who were descended lineally from the original owners. Walpole's famous letter anent Drayton was written July 23, 1763. Lady Betty left the estate to Lord George Sackville, from whom the present owner is descended. Her graceful reception and agreeable hospitality were in harmony with the traditions of Drayton. Lowick Church was next visited, notable externally for its bold tower, octagonal lantern, and flying buttresses; and notable internally for its fine brass of Sir Henry Greene (died 1467), and its alabaster tombs of Ralph Greene (1420) and Edward Stafford, Earl of Wiltshire (died 1499),—both exquisite works,—unique in parts. The "old oak" at Lowick, over ninety yards round the ends of the branches, will, it is feared, go quickly to its end. Last year the inside of the tree was burnt out. The fire was got under without the aid of the fire-engines, but the noble relic of the great forest was fearfully injured. At Lyveden stands another of Sir Thomas Tresham's buildings, quite as ingenious, and very much less *bizarre* than the Triangular Lodge. Lyveden New Building is not only remarkable for its quaint symbolism (the Passion being here commemorated), but for the purity of much of its architectural detail, very unusual for the time in which it was built. The Old Building is, in fact, rather younger than the New Building, but stands on the site of one of the ancient family seats of the Treshams, and between the two buildings are remains of fish-ponds and terraces, which bear witness to the lordly scale of the gardening of Elizabeth's time. Brigstock was the last halting-place. Here the remains of a considerable Saxon church, incorporated with the Mediæval building, indicate the existence of an early civilisation in that part of the county, a fact further confirmed by the records of Rockingham. The Manor-house is largely of a date previous to Elizabeth's time,—the great era of house-building,—and is supposed to have been the birthplace of that Sir Edward Montague, the Lord Chief Justice, who founded Boughton and the family of Montague of Boughton, and now lies buried in Weekley Church. In this house is an ancient wardrobe, which "goes with the house," because too large to be taken away; also a sixteenth-century bedstead, in which King John, of evil memory, "slept the night before he crossed the water." (!)

On the last day, Friday, the Association first drove to Rockingham, and thence by Gretton to Kirby. Rockingham has had, perhaps, a more eventful history than any house in Northamptonshire. From the earliest times it seems to have been a stronghold. William the Conqueror found it fortified, and left it more so. All the early kings, especially John, used to hunt here, and much of the place, as built by them and their successors, remains to this day, surrounded by later additions. The family of the present owner, Mr. Watson, obtained possession of the place in Henry VIII.'s reign, and the larger part of the existing buildings were built by them at various times, chiefly during the seventeenth century. The effect of the mixture of styles, and the commanding position of the place, give it a charm of its own. Nothing more interesting, each in its own way, could be found in any part of England than Rushton, Drayton, Rockingham, and Kirby. Kirby was the last important place visited, and it is the richest in detail. Here may be seen, side by side, the work of two of England's greatest architects, John Thorpe and Inigo Jones. Thorpe seems to have designed a considerable amount of work, completing a house carried well forward previously by "Humfre Stafard,"—as he called himself on the parapet outside the great hall; while at a later date (1638, &c.) Inigo Jones was employed to remodel some of the façades. Kirby is, indeed, a melancholy place. Ruin works swiftly and silently before our very eyes. Every visit reveals some fresh disaster. Even now the south-eastern staircase, with its elaborate ceiling, trembles to its fall, and it is only held in place by pieces of the wooden wall-linings. The roof of the great hall has leaked till the wall is green and crumbling, and very soon this magnificent apartment will be open to the sky. Trees are growing on the walls and rending them to pieces, aad if the cruel neglect is continued, a few years will see the last stones hurled to the ground to be broken up, as stones are at the present moment being broken up, to mend roads. Stanion Church, which has a good Perpendicular arcade and an elegant tower and spire, was seen and sketched on the way to Kettering. The proceedings thereafter were the final dinner, a little speech-making, and a due remembrance of "Auld lang syne." Saturday morning was spent at Kettering Church. Its tower and spire of the same class as Oakham and All Saints, Stamford, but with many points of difference in general arrangement and in detail, had been well in view all the week,—from near and far as the party left and came back towards their headquarters; and its pleasing outline in the centre of many a picture will dwell in memories which will recall with pleasure many other good points seen and noted in the interesting district.

THE APPROPRIATION OF WAGES AND INCOME.

IN the Economic Science and Statistics Section of the British Association meeting at Southampton, Professor Leone Levi read the report of a committee appointed for the purpose of continuing the inquiries into the appropriation of wages and other sources of income, and considering how far it was consonant with the economic progress of the United Kingdom. The report set forth that out of a gross personal expenditure amounting to about 878,000,000*l*., some 728,000,000*l*., or about 83 per cent. was probably spent on necessaries, and 150,000,000*l*., or 17 per cent. on luxuries and waste. Out of a net or national expenditure of about 684,700,000*l*., about 614,000,000*l*. was probably spent on necessaries, and about 70,000,000*l*. on luxuries, the percentage being respectively 89 and 11. The nation in reality spent only the half of what the individuals spent on luxuries, because large portions of these consisted of taxes and profits of distribution which remained in the country. Of late years the expenditure on the necessaries of life had greatly increased, and a comparison of the quantities per head consumed of the principal imported articles showed not only that people had much greater command over the articles of food than they previously enjoyed, but that their expenditure on these occasions had increased in a larger proportion than the expenditure on alcoholic drinks and other luxuries. Likewise the expenditure on house rent had largely increased, partly from the increased cost of houses, and partly from the greater capacity of the people to enjoy the comfort of a commodious home. Comparing 1881 with 1831, there was a large increase in the number of persons living in houses at high rents. Another evidence of the increasing prosperity of the country and of the productive manner in which the money was spent was that there was reason to believe that the labouring classes represented 70 per cent. of the population, and the middle and higher classes 30 per cent. In other words, 26 million persons might be taken to belong to the labouring classes, and 11 million persons to the middle and higher classes. The approximate division of expenditure between the classes was as follows:—Gross personal expenditure.—Working classes, 423,600,000*l*; middle and higher classes, 454,400,000*l*. Net or national expenditure.—Working classes, 333,300,000*l*.; middle and higher classes, 351,400,000*l*. With regard to the relative expenditure of the classes on necessaries and luxuries, the figures were as under:—Working classes.—Personal expenditure, 80 per cent. on necessaries and 20 per cent. on luxuries; national expenditure, 90 per cent. on necessaries, and 10 per cent. on luxuries. Middle and upper classes.—Personal expenditure, 86 per cent. on

necessaries, and 14 per cent. on luxuries; national expenditure, 89 per cent. on necessaries and 11 per cent. on luxuries. The working classes appeared thus to devote a larger proportion of their incomes to luxuries than the middle and higher classes, a fact all the more to be regretted since they were thereby left with so much less available for necessaries. The total income of the people of the United Kingdom might be taken at about 1,000,000,000*l.* Estimating the total earnings of labouring classes at 436,000,000*l.*, and those of the middle and higher classes at 564,000,000*l.*, it would be seen that after expenditure there would be left to the working classes a surplus of 13,000,000*l.*; and to the middle and higher classes one of 110,000,000*l.* The general results of the inquiry were not discouraging. It was gratifying to know that the great bulk of the income of the people was productively expended, and that though much devoted to luxury, and a goodly portion was wasted, still a handsome annual surplus remained for reproduction, which went to swell the capital of the nation.

In the discussion which followed,

Professor H. S. Foxwell said that the whole report was based on a distinction between what was called necessary and luxurious expenditure. Such a distinction was quite one of gradation. It was impossible to draw an absolute line, and there would be very great dispute about the point at which the Professor drew it. For instance, the Professor excluded from the list of necessaries amusements and other things which many persons would include. The dullest and most intolerable form of life would be that in which people were only consuming and producing necessaries, a life which must cease for want of energy. He thought that consumption was considered somewhat too narrowly. He regarded it as an incentive to industry.

Mr. Hurst urged that it was by some people enjoying luxuries that numbers of other persons were enabled to get bare necessaries of life.

Mr. M'Knight referred to the culpable misspending of money involved in the giving of the dinners of large London companies, and pointed out that while the working classes spent 9,200,000*l.* on tobacco, they only expended some 1,100,000*l.* on education.

Mr. Stephen Bourne submitted that, taking them broadly, the conclusions of the report must be considered to be correct, and contended that all labour should be applied to that which was useful, though it might not all be reproductive.

Sir Rawson Rawson remarked that it appeared that the expenditure of the upper class family was only two and a half times that of a labouring class family. Another still more extraordinary fact was that the taxation paid by the working classes was 16s. 1d. per family, and for the middle and higher classes 16*l.* 6s. 10d. Again, the surplus after expenditure in the case of the working classes was 3 per cent. on the income, and in the case of the upper classes 20 per cent. It was also remarkable that the expenditure of the lower classes on beer and spirits was just double that of the upper classes, while, of course, on wines the excess was in the upper classes. He noticed that whereas the increase in the consumption of spirits, wine, and tobacco, between 1840 and 1880, was 75 per cent., the increase in regard to cocoa, raw sugar, and tea was 272 per cent.

After replying upon the discussion, Professor Levi referred to the fact that during the year two members of the committee, Professor Jevons and Sir Antonio Brady, had died, and moved a resolution, which was seconded by Sir Rawson Rawson, and carried, setting forth that the section deeply deplored the loss of the late Professor Jevons, a former president of the section and a member of several committees at different places.

HOUSES WITHOUT DAMP-PROOF COURSES.

AT a meeting of the directors of the Nineteenth Century Building Society on the 30th ult., at the offices, Adelaide-place, Mr. H. Waldemar Lawrence in the chair, the following resolution was passed, on the motion of Mr. Mark H. Judge:—

"That, as certain houses now being built in West Ham, and proposed to be purchased through the Nineteenth Century Building Society, have been found by the society's surveyors to have no damp-proof course, the directors refuse to advance any money on property so built, and hereby instruct the Secretary to ask the local authorities whether such houses are being built with their approval."

MODERN FACILITIES FOR LOCOMOTION AND TRANSPORT.

MR. JOHN FOWLER, C.E., as president of the Mechanical Science Section of the Southampton meeting of the British Association, in his inaugural address, said:—

Of all the important sections of the British Association, the one over which I have now the honour of presiding is, you will all, I think, admit, at once the most practical and the most characteristic of the age. In future times the present age will be remembered chiefly for the vast strides which have been made in the advancement of mechanical science. Other days have produced as great mathematicians, chemists, physicists, warriors, and poets, but no other age has made such demands upon the professors of mechanical science, or has given birth to so many men of eminence in that department of knowledge. Though a member of the profession myself, I may venture before my present audience to claim that the civil engineer is essentially a product and a type of the latest development of the present century. Telford has admirably defined the profession of a civil engineer as "being the art of directing the great sources of power in Nature for the use and convenience of man, as the means of production and of traffic in states both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigation and docks, for internal intercourse and exchange, and in the construction of ports, harbours, moles, breakwaters, and lighthouses, and in the art of navigation by artificial power for the purposes of commerce and in the construction and adaptation of machinery, and in the drainage of cities and towns." This definition, written more than half a century ago, is wide enough to include all branches of engineering of the present day, although amongst those specifically mentioned the departments presided over by the railway engineer, the locomotive superintendent, and the electrician will be looked for in vain. As Telford was beyond all question the most widely experienced and far-seeing engineer of his time, this little omission well illustrates and justifies my statement that the typical civil engineer of the day is a late product of the present century; for even Telford never foresaw the vast changes which railways, steam, and electricity would evolve in the course of a few years.

There have undoubtedly been published during the last fifty years many works of mark and merit, but the work which above all others would, I think, have astonished and perplexed our ancestors, is the little one known to all the civilised world as "Bradshaw." This indispensable handbook of the nineteenth century testifies that the face of the country is dotted over literally with thousands of railway-stations; that between many of these stations trains run at two-minute intervals, whilst the distance between others is traversed at a mean speed of nearly sixty miles an hour. The public are often justly indignant at the want of punctuality on some railways, but they should blame the management and not the engineers, for the daily conduct of the heavy traffic between England and Scotland shows, that notwithstanding the constantly varying condition of wind and weather in this climate, a run of 400 miles can, on a properly laid out railway, and with suitably designed rolling-stock, be accomplished with certainty to the minute, if the management is not at fault. On the Great Northern Railway, for instance, of which I am consulting engineer, the 400 miles between London and Edinburgh is traversed in nine hours, or deducting the half-hour allowed at York for dining, at the mean rate of no less than forty-seven miles per hour including stoppages. A few months ago the Duke of Edinburgh was taken on the same line of railway from Leeds to London, a distance of 186¾ miles, in exactly three hours, or at a mean rate, including a stop at Grantham, of over sixty-two miles an hour. I know of no railway in the world where this performance has been eclipsed.

An essential condition of the attainment of high speed on the railway is that the stopping places be few and far between. The Great Northern express previously referred to makes its first halt at Grantham, a distance of 105 miles from London, and consequently but little power and time are lost in accelerating and retarding the speed of the train. In the instance of the Metropolitan Railway, on the other hand, the stations average but half a mile apart, and although the engines are as powerful as those on the Great Northern Railway, whilst the trains are far lighter, the average speed attainable is only some twelve miles an hour. No sooner has a train acquired a reasonable speed than the brakes have to be sharply applied to pull it up again. As a result of experiment and calculation, I have found that 60 per cent. of the whole power exerted by the engine is absorbed by the brakes. In other words, with a consumption of 30 lb. of coal per train mile, no less than 18 lb. are expended in grinding away the brake blocks, and only the remaining 12 lb. in doing the useful work of overcoming frictional and atmospheric resistance.

Nearly thirty years ago, when projecting the present system of underground railways in the metropolis, I foresaw the inconveniences which would necessarily result from the use of an ordinary locomotive, emitting gases in an imperfectly ventilated tunnel, and proposed to guard against them by using a special form of locomotive. When before the Parliamentary Committee in 1854, I stated that I should dispense with firing altogether, and obtain the supply of steam necessary for the performance of a single trip between Paddington and the City from a plain cylindrical egg-ended boiler, which was to be charged at each end of the line with water and steam at high-pressure. In an experimental boiler constructed for me, the loss of pressure from radiation proved to be only 30 lb. per square inch in five hours, so that practically all the power stored up would be available for useful work. I also found by experiment that an ordinary locomotive with the fire "dropped" would run the whole length of my railway with a train of the required weight. Owing to a variety of circumstances, however, this hot-water locomotive was not introduced on the Metropolitan Railway, though it has since been successfully used on tramways at New Orleans, Paris, and elsewhere.

A reference to the Underground Railway naturally suggests the wider question of tunnels in general. To foreign engineers belongs the honour of having boldly conceived and ably accomplished tunnel-works of a magnitude which would have appalled a canal engineer. I need only refer to the Mont Cenis Tunnel, over 7½ miles in length, commenced in 1857 and finished in 1870; the St. Gothard Tunnel, 9¼ miles in length, commenced in 1872 and finished in 1882; and the Hoosac Tunnel, 4¾ miles in length, commenced in 1854 and finished in 1875. In all cases rock of the hardest character had to be pierced, and it is needless to remark that without the aid of the machinist in devising and manufacturing compressed air machinery and rock-boring plant the railway engineer could not have accomplished the task. Tunnels under broad navigable rivers and estuaries have been a subject of discussion by engineers for at least a century, but the only one at present completed is the unfortunate and costly Thames Tunnel. Two important works of the class are, however, now well in hand, namely, the Severn Tunnel at Portskewet, and the Mersey Tunnel at Liverpool.

In many cases of tunnels under estuaries, special appliances could be used which would obviate all risk and make the successful completion of the work a mathematical certainty. A tunnel under the Humber, about a mile and half in length, projected by myself in 1873, the Bill for which was subsequently passed by the Commons and thrown out by the Lords, was a case in point. The bed of the Humber is of very fine silt, and I proposed to build the tunnel in lengths of 160 ft., under the protection of rectangular iron caissons, 160 ft. long by 42 ft. wide, sunk by the pneumatic process. As the pressure of air in the caissons would always be slightly in excess of that due to the head of water in the river, no interruption from influx of water could ever occur, and the operation of building the tunnel in lengths inside this huge diving-bell would be as certain and free from risk as the everyday work of sinking a bridge-pier by the pneumatic process.

At the beginning of the present century a committee was appointed to consider the "practicability of making a land communication by a tunnel under the river Forth, at or near Queensferry." In a report dated November 14, 1805, it was recommended that a double tunnel should be constructed, at an estimated cost of 164,000*l.*, or at the rate of 30*l.* per yard, exclusive of shafts and pumping. The surveyors reporting grounded their belief in its

practicability upon the fact that at Borrowstowness coal workings had been carried under the same Firth for a mile, and that at Whitehaven coal was worked for the same distance under the Irish Sea, in both places less water being met with under the sea than under the land. The report concludes in the following words:—"That a more easy and uninterrupted communication betwixt every part of a country increases the intercourse of commerce, arts, and agriculture, all must know. Ferries are still and often a formidable bar in the road. Of these in this country, the one under review at Queensferry is, perhaps, the most conspicuous. It is, in fact, the connecting point betwixt the north and south of Scotland, and indeed of the realm, and in this point of view the improvement of it must be considered a national object." These words are as true and applicable to the case in 1882 as they were in 1805. A ferry still is the only means of communication across the Forth at Queensferry, though the traffic has increased a hundredfold. Parliament, by the passing of the Forth Bridge Act during the present session, has given a practical recognition of the truth of the statement in the above-quoted report, that the improvement of the Forth passage is a "national object."

MURAL DECORATION IN GERMANY.

THE political union of Germany has done much of late years to render men's minds capable of appreciating the work of such men as Janssen and others, who have, to a certain extent, founded a new school of German art. Though they no longer reside there, Düsseldorf claims the merit of having sent out these apostles of a new artistic creed, and as the *Kölnische Zeitung* lately remarked, Rhineland has every reason to be proud of this new school of monumental painting which has been so successfully inaugurated within the bounds of the province.

The principal work on which Herr Janssen has lately been engaged is the mural decoration of the Erfürt Town-hall. The sides of the staircase leading to the principal chamber will in a short time illustrate Thuringian legends and episodes from the life of Luther, in which the traditions of the old city afford the artist a great variety of subjects for treatment. The walls of the principal chamber have been covered with representations of local historical events. Three of the walls (each about 45 ft. in length) have been thus ornamented, the windows taking up the greater part of the fourth or western side. There are nine subjects treated, six of them being strictly historical, and three allegorical. The latter are above the entrance doors and are on a gold ground, which harmonises with their general character.

On the north side of the room the series of pictures commences with the introduction of Christianity in 719 by St. Boniface, who is represented in his monk's garb preaching to a crowd. The assembly includes many of the barbarian invaders who had settled in the district of Erfürt, whose gigantic stature and warlike mien contrast effectively with the figures of women and children which complete the *tableau*.

The diet held in St. Peter's Church, Erfürt, in 1181, by Frederick Barbarossa is strikingly represented. The principal circumstance delineated is the request for the emperor's pardon, which Henry the Lion made on that occasion, after his unsuccessful resistance during the previous year to the imperial authority.

The storming of the fortress of Ilmenau by the Erfürt ironworkers, and the attack on the town-hall in the year 1509, are delineated with much dramatic effect. The latter event is depicted at the moment when the populace has succeeded in breaking into the magistrates' chamber, and when its leaders are stating their demands.

The entry into the city of the Elector, John Philip, of Mayence, forms the subject of another of the pictures, and the richness of colouring which the costumes enable the artist to introduce with strict appropriateness adds much to its effect.

The last of the principal works represents the destruction of an obelisk made of wood and of canvas painted to represent marble. This monument had been erected by the French during their occupation of the city in the year 1810, and bore the inscription, "To Napoleon the Great." When the Prussians some time afterwards occupied Erfürt, the citizens destroyed this memorial of foreign invasion, and the moment selected for the vivid sketch of the event Herr Janssen has reproduced is that at which the destruction of the obelisk was taking place.

The allegorical paintings correspond in a general way with the historical works we have described, and serve to fill up many points of interest in the history of the old Thuringian city.

The town-hall at Hanover has also been treated in a more or less similar style by Herr Schafer, who has during the last five years been associated with the architect, Herr Hase, in the restoration of the building. The principal chamber is more than 70 ft. in length, and about 36 ft. wide. In the absence of such events in the local history as would admit of effective pictorial representation, the artist has produced on an extensive scale a series of allegorical pictures of the rivers of North Germany. Heraldic figures are also introduced in an appropriate manner, and various symbolical delineations complete the mural decoration of the chamber.

ENGLISH IRON IN GERMANY.

ACCORDING to a statement in the German press, on account of the low rates of freight from the United Kingdom to Hamburg by steamer, and the facility which the railways in Germany afford for the transport of imported iron, the Berlin purchasers for manufacturing purposes can get the English article at a price which competes successfully with the products of native industry. The first cost of iron at the works in Germany seems to be about 25 per cent. above the value of Scotch iron f. o. b. at Glasgow. The railway carriage to Berlin costs nearly as much as the freight, duty, and railway carriage on the imported article. Hence the supposed aduantages of the protective policy are lost. The matter is being brought before the Imperial Government of Germany with a view of obtaining such concessions in the railway rates of carriage of iron as would do something towards assisting the position of the German iron industry, and thus swelling the traffic receipts of the various lines interested.

As an instance of the extent to which our iron is used in Germany, it is stated that the lamp-posts in Berlin are made of English metal.

So much the better for the Berliners, looked at properly.

THE ENGLISH CHURCH AT PONTRESINA.

THE English church at Pontresina, in the Engadine, was opened on August 19, and consecrated by the Bishop of Bedford. A novel feature in the church is the substitution of wood for stone in the nave arches and clearstory. The plan is that of a parallelogram, 78 ft. by 56 ft. There is no external indication of the chancel, as the site was so limited in length that it was necessary to carry the aisles to the full extent of the ground in order to gain the required accommodation. A porch occupies the second bay on the south side. The side walls are 2 ft. 3 in. thick, of rubble with granite dressings; they vary in height as the ground falls rapidly from east to west, so much so, that there is a height of 20 ft. below the floor at the west end. This is utilised as a store-room, and could be adapted for warming apparatus. It has wide pointed arches towards the west, and at the sides. The style is Pointed, of the simplest character. The church is lighted by lofty triplets at the east and west, and by low coupled lancets at the end; the windows of the clearstory are trefoils pierced through the woodwork, those of the chancel bay are quatrefoils.

Internally there are five bays, formed by clustered wooden columns composed of four semicircular shafts with Early English capitals; from these spring smaller shafts supporting the principals of the nave, the wooden arcade, and the principals of the aisle roof. The spandrels are filled with plain boarding; those in the chancel are panelled; the arches are strengthened by struts, the intervening spaces being filled with open tracery. The easternmost bay forms a spacious chancel. A high screen divides the organ-chamber on the north side, and a similarly enclosed screen the vestry on the south side from the chancel. The altar, which is very massive, has six circular columns, with foliated capitals.

The plans were furnished by Mr. R. P. Pullan, who had designed a smaller church for the same site in 1874, and were excellently carried out by Mr. Ragatz, of Zurich. H.R.H. the Princess Christian, who has taken the greatest interest in the progress of the church, presented a handsome frontal, executed by the ladies of the South Kensington School of Needlework under Mr. Pullan's superintendence. The Princess also carried out the greater part of the floral decorations for the day's consecration. Mr. and Mrs. Bancroft were liberal contributors to the edifice,—they gave the central light of the eastern triplet, by Mayer, and also the bell. The Rev. J. W. Ayre, of St. Mark's, Grosvenor-square (the summer chaplain), who originated the present plan and collected the funds for its execution, presented the jewelled cross. The Rev. J. Nixon gave an ornamental fald-stool; and many of the visitors to the happy valley of Pontresina contributed largely to the funds.

The church seats 350 persons.

ROOD SCREEN AND IRMENSAÜLE, HILDESHEIM.

WE have previously given views and descriptions of the beautiful old Mediæval town of Hildesheim and its interesting cathedral, and it is now our intention to speak more in detail concerning the remarkable rood-screen and the very ancient and singular column called "Irmensaüle," which stands upon the flight of steps leading to the choir of the church.

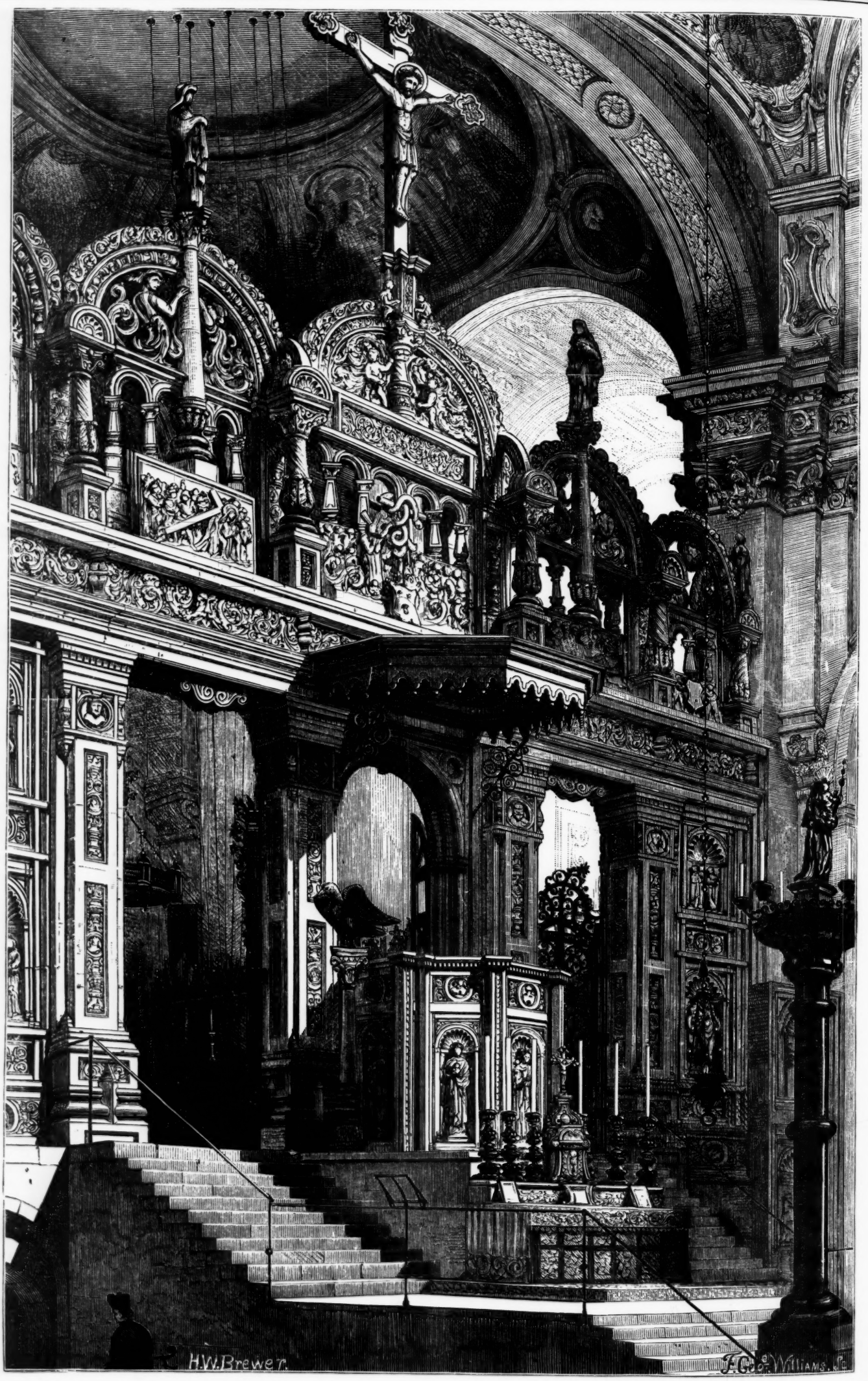
The rood-screen in Hildesheim Cathedral is one of the most remarkable examples of the Early Renaissance to be found in Germany. It appears to have been erected about the year 1550, and its erection may be accounted for by the fact that in 1542 the cathedral was taken possession of by the Lutherans, who excluded the bishop and canons from the building, and subsequently closed it altogether. After the battle of Muhlberg, however, in which John Frederick, Elector of Saxony, was taken prisoner by Charles V., the church was given back to its original owners, and the bishop and canons were re-established, and this rood-screen is probably a portion of the restoration which the cathedral underwent at that time. This must not be confused with the entire restoration of the building after the thirty years' war, when the church was covered internally with plaster ornaments in the Rococo style. The names of the architect and sculptors employed upon the rood-screen at Hildesheim appear to have been lost, and it is rather strange that this beautiful and interesting work is unnoticed by those indefatigable antiquaries, Kugler and Rosengarten. All that appears to be known is that it was erected at the expense of a canon of the cathedral, named Freitag. It is constructed of a very fine sandstone, and (called in Germany "kreidesandstein") brought from the neighbourhood of Munster, in Westphalia. It is in a most remarkable state of preservation. The position of the pulpit in the centre of the screen is, as far as we know, unique. The desk for the Gospel consists of an eagle composed of brass, gilt. Whether there was originally an altar in front of this pulpit is doubtful, but the arrangement of the steps and platform would seem to suggest that one was intended, although the present altar is certainly modern.

The Irmensaüle which stands upon the steps in front of the screen is of very great antiquity, and was either an object of worship in Pagan times, or was used as a column supporting a statue of the god Armia. The metal-work bearing candles, which this column supports, dates from the twelfth century. The many other works of art contained in this cathedral have been previously described in this journal, and the great "coronæ," bronze font, and stalls have been illustrated.

WINDOW SCREEN FROM CAIRO.

THIS is one of several fine specimens of lattice woodwork now in the South Kensington Museum. The workmanship is somewhat rude, but admirably adapted to its purpose. In its original position, high up in some Eastern street, and with a beautiful play of light and shade upon it, the screen, no doubt, looked most picturesque.

W. A.



THE ROOD-SCREEN IN HILDESHEIM CATHEDRAL.

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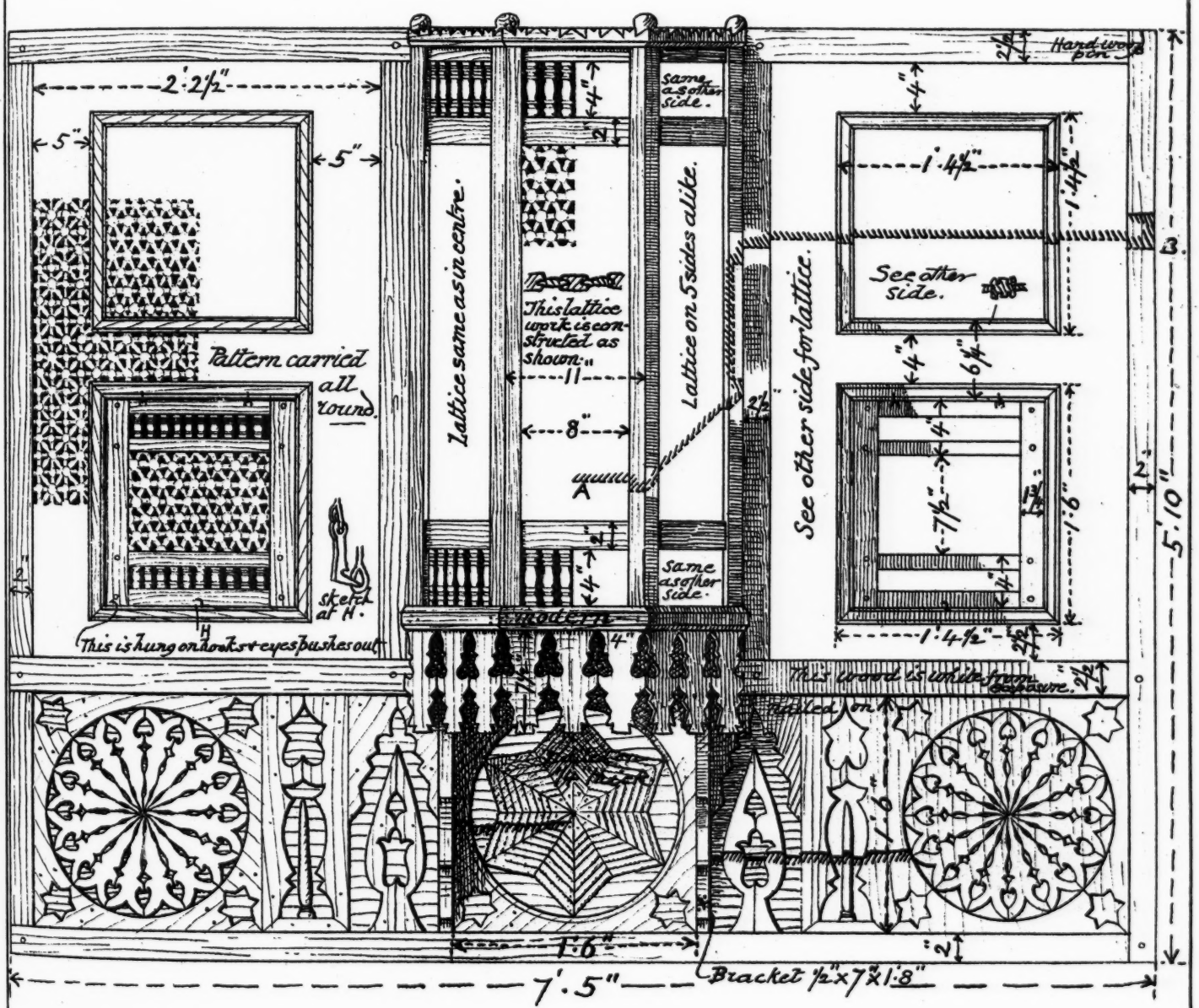
PROPOSED ASSEMBLY ROOM
OLD RED LION HOTEL. COLCHESTER.

Window Screen from Cairo. 17th Century

Now at S. Kensington.



Walter Aston.
Mons. & del. May 27th 82.

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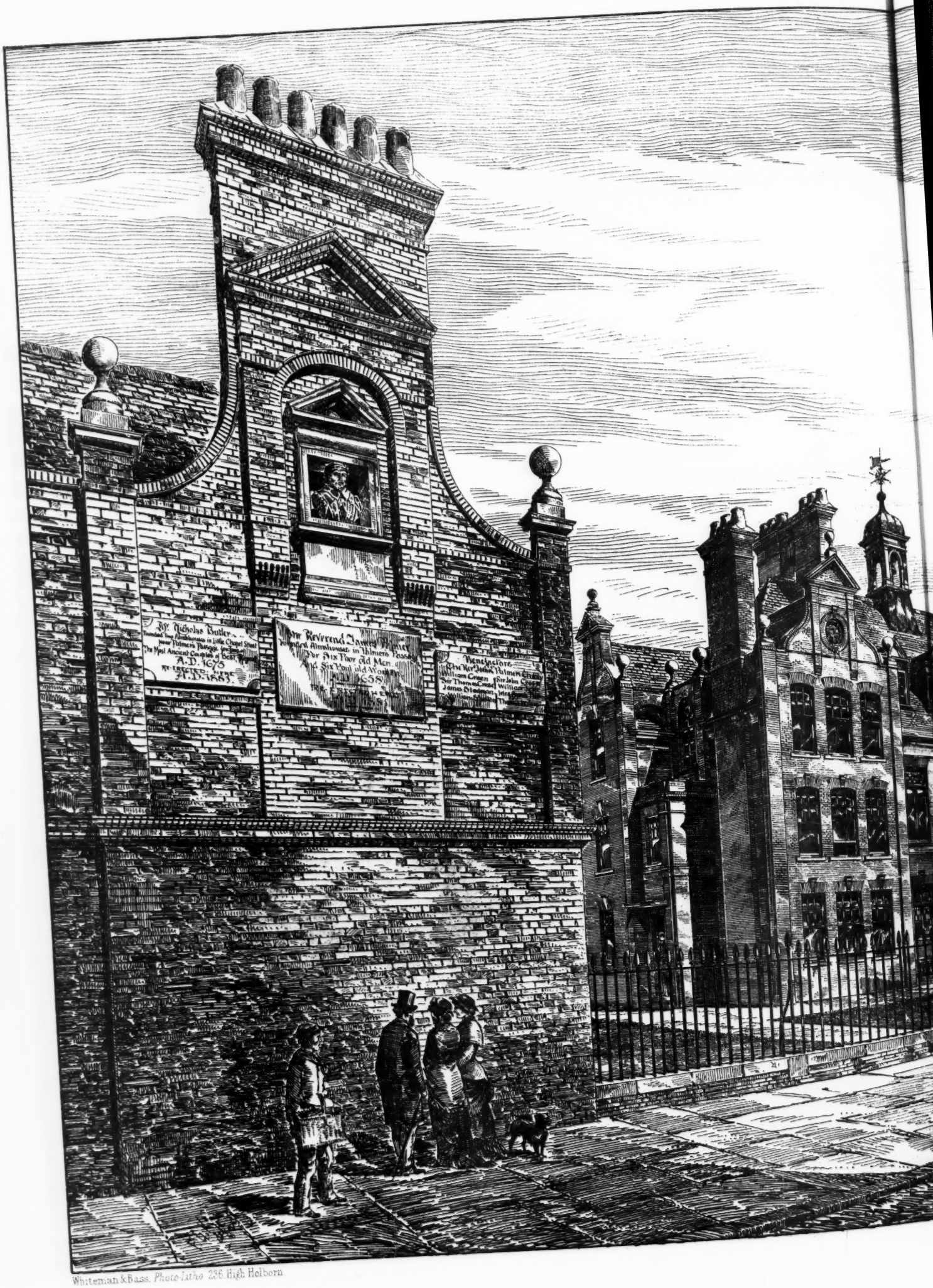

Whiteman & Bass, *Photo-Litho* 236 High Holborn

New United Westminster Alms Houses: Rochester Row: Westminster

The late R. R. Arndt, F.S.A. Archt. completed by Ernest A. Adams, A.R.I.B.A. Archt.

Wyman & Sons, Printers, C^t Queen S^t

ASSEMBLY ROOM, LION INN, COLCHESTER.

THE Assembly Room to be built at the Old Red Lion Inn, High-street, Colchester, of which my drawing is an internal view, is part of a large addition now being carried out under my direction for the owner, Mr. W. Wilberforce Daniel. It has been designed in character with the house, one of the few remaining examples of Domestic Tudor buildings in the country.

It was probably built about 1470 as an inn, but I can find no mention of it prior to 1529, at which date it had its present name, but, I should imagine, had been renamed somewhat prior to that date, as the spandrels over the entrance-gateway are filled in with very bold carvings of St. George and the Dragon, from which I infer that was the original sign of the house.

In carrying out extensive restorations during the past two years I have found (covered up some seventy years since) many beautifully-moulded beams, floor-joists, carved corbels, &c., and the greater portion of the first-floor front to the street covered with oak tracery panels in a very good state of preservation, but now covered with lath and plaster, but which I hope eventually to uncover and restore.

The whole of the internal and external walls above the basement are constructed of oak and chestnut timbers filled in with wattles and clay.

At some future time I will ask you to kindly publish a drawing of the street front as restored, it being, I think, a very interesting example of fifteenth-century timber construction.

F. EVELYN MORRIS.

THE UNITED WESTMINSTER ALMSHOUSES.

WE give a view of the new Westminster Almshouses. They are intended for eight married couples and eighteen other persons of good character, not less than sixty years of age, who have been resident in the united parishes of St. Margaret and St. John the Evangelist, and have been erected in pursuance of a scheme of the Charity Commissioners, dated 11th July, 1879, which consolidated the Ancient Almshouse Charities, founded and endowed by the Rev. James Palmer in the year 1656, by Mr. Emery Hill in the year 1708, and by Mr. Nicholas Butler in the year 1675, the Charity of Mr. Emery Hill having been generously endowed, in the year 1859, by the late Mr. James Chadwick, an old inhabitant of Westminster, with the sum of 1,500*l.* new 3 per cents, and by his widow with the like sum of 1,500*l.* in the year 1860, in order to increase the monthly allowances to the inmates. When originally founded, Palmer and Hill's Charities had attached to them schools for the instruction of a certain number of boys, but by the Endowed Schools Act, 1869, the scholastic branches and nearly one moiety of the endowments of these two charities were transferred to the United Westminster Schools, and thereupon Mr. Frederick Seager Hunt, the treasurer of Palmer's Charity, the late Mr. Wm. Freeman, the treasurer of Emery Hill's Charity, and Mr. Edgar Horne, the chairman of the Trustees of Butler's Charity, came to the conclusion that it would be to the interest of the charities that the three Almshouse Branches, some of which were occupying very valuable sites, should be amalgamated, and they accordingly brought the matter before their respective Boards, who at once concurred in an application being made to the Charity Commissioners for a scheme for that purpose, which met with the entire concurrence of the Commissioners.

The trustees sold the freehold sites of Palmer and Butler's Almshouses in Victoria-street, in May, 1880, which enabled them to purchase the freehold of the site of Emery Hill's Almshouses, on which the new Almshouses have been built. The site had been previously held on renewable leases from the Dean and Chapter of Westminster, but whose power of renewal had lapsed by the transfer of their property to the Ecclesiastical Commissioners.

The new buildings were commenced in May, 1881, and provide for the same number of almspeople as the old foundations, with the great advantage that the almspeople have two rooms each instead of one, and after providing for their comfort in every way, and a separate laundry and drying-room, so as to supersede the necessity of washing in their living-rooms, and a sum of 100*l.* a year for exhibitions in compliance with Mr. Nicholas Butler's will, the trustees have already been enabled to grant pensions of 20*l.* a year to eighteen persons living with their relatives and friends.

The building consists of a centre and two wings. The south wing contains twelve almshouses, to accommodate the number maintained in the old Palmer's Almshouses. The north wing contains twelve almshouses, to accommodate the number maintained in the old Emery Hill's Almshouses; and the centre block contains two almshouses, to accommodate the two married couples formerly maintained in the old Butler's Almshouses, besides the board-room and offices, the rooms of the superintendent, who is to be responsible for the internal management of the almshouses and the comfort of the almspeople; also a separate infirmary, and apartments for the nurse.

The buildings have been erected by Messrs. Adamson & Sons, from designs by the late Mr. Robert Richard Arntz, upon whom they reflect great credit for the thoughtfulness and care exhibited. Since the lamented death of Mr. Arntz, Mr. Cole A. Adams, who had been associated with him in preparing the plans and drawings, has superintended the completion of the buildings, with the assistance of Mr. Thomas Higgs, the clerk of the works, to the entire satisfaction of the trustees.*

THE ARCHITECTURAL AND ENGINEERING CONGRESS AT HANOVER.

THE fifth congress of the Union of Architects' and Engineers' Societies (which has just been held at Hanover) was arranged two years ago, and during the interval the worthy burghers of that city have been keeping before them the important nature of the event. On a previous occasion in 1862, there had been a meeting of a similar character at Hanover, though it was apparently before the incorporation of the body which summoned this congress. The importance of Hanover as a centre of artistic influence has increased of late years, Herr Schaper having contributed, by his mural decoration of the restored town-hall, towards the result thus arrived at.

The preliminary assembly of delegates (forty in number, from nineteen societies) met on the 18th ult. After some business of a formal character had been transacted, a resolution was adopted asking the Hamburg Society to prepare specimen forms of contracts made with architects. It was also resolved to ask the Government to publish in their present form the details of public buildings in Germany which have lately been collected. The better and more economical employment of water, from agricultural, industrial, and commercial points of view was likewise discussed. A commission was appointed to report on the best means of preventing the profitless expenditure of architectural work which sometimes takes place in public competitions. The question of normal regulations for the delivery of iron constructions was referred for special discussion to the Saxon Association of Engineers and Architects, which had already been dealing with the subject. The question of technical education in connexion with architecture was the subject of lengthy deliberation. Reports were presented on the subject from Munich, Hamburg, Hanover, Stuttgart, Cologne, and Schleswig-Holstein. The present system was generally considered as being unsuitable to existing requirements.

At the second assembly of delegates, which took place on the 19th, Herr Kohler alluded to the proposed restoration of the castle at Heidelberg, and mentioned that the renovation of this monumental work would be an appropriate gift from the German nation to the University of Heidelberg, on the 500th anniversary of its foundation which it will be celebrating in 1886. The question of utilisation of water which had been brought forward on the preceding day came up for further discussion, and was referred to a select commission. The unfavourable position in which young architects are at present situated in Germany was the subject of a special report from the Berlin Society. According to the particulars brought forward, the overcrowded state of the profession becomes painfully apparent when any official position is being competed for, and the opinion is ventured that this state of things is likely to grow worse rather than to improve, unless the extensive publication of the facts of the case serves to deter candidates for admission to the profession from continuing their efforts in that direction. The suggestion was also made that the suspension of works of a public character should be so arranged that a larger staff of technical men should be employed. The use of glazed tiles for roofing and facing purposes, and the system of normal models for rolled iron, were also discussed. The further elucidation of the subject of "Typical Dwelling-house Plans" was entrusted to the Mid-Rhenish Society. A question of special interest was also brought forward with reference to the effect of the season at which wood is cut, on its quality and durability. The proposal to erect a monument to Semper was approved, and the proceedings of the delegates then terminated.

The festivities which took place on Sunday, the 20th, in connexion with the reception of the guests, were characterised by the heartiness of friendly feeling which the occasion inspired. The railway station is well known to travellers in North Germany as being one of the best specimens of its kind on the Continent, and being provided with the electric light, was striking in its general appearance. The addresses of welcome, delivered at the Rath-haus by Herr Culemann and Professor Lange, were appropriate in their character.

On Monday, the 21st, the business of the Congress commenced in earnest, under the presidency of Herr Köhler, the secretaries being Herr Sprengell and Herr Demanget. The first paper was read by Herr Kyelmann, upon "The Value of Exhibitions for Technical Purposes." He referred to the technical skill developed in the construction of suitable buildings, and contrasted the principles which have guided French and English architects in the general internal arrangements of such structures. The Paris Exhibition of 1878 he considered as having been specially valuable to the cause of architecture, inasmuch as it enabled the careful observer to note the pervading features of the art in its modern French form, and, at the same time, gave due prominence to details affecting the restoration of Mediæval structures. Another useful feature of the display was the facility of contrasting the iron constructions of various nations. As a general argument, he maintained that the careful and intelligent arrangement of objects not absolutely novel was often of more practical use than the exhibition of articles, which, though new, were not placed with due discrimination and knowledge of their relations to surrounding objects. In conclusion, he remarked that the too great abundance of exhibitions which had existed was being remedied, and while advocating special exhibitions in preference to those of a comprehensive nature, he expressed himself as opposed to such special displays as sought to cover too wide an expanse of science, art, or industry, considering that the more limited the scope, the better was the prospect of the advancement of technical progress in the direction selected for illustration.

The work of the sections commenced at noon. That of architecture occupied itself in the first instance with Herr Hase's paper on German town-halls in general, with special reference to that of Hanover. There are, it would seem, not many old town-halls in Germany, and none of them have retained their original form without alteration. The oldest is that of Dortmund, which dates from the twelfth century, and in which provision is made for festivities and public assemblies, as well as for the administration of justice. That of Gelnhausen has some points of resemblance with the Dortmund structure, and dates from the same period. That of Lubeck (which as early as 1276 suffered from a fire) shows the influence of Italian art in its general character, this fact being explained by the important commercial relations existing between that city and the ports of Southern Europe. The remains of this notable building enabled Viollet-le-Duc to complete his studies as to the architectural features of town-halls of the period named. The edifices at Stralsund and Rostock partake to a certain extent of the general features of that of Lubeck. In Dantzig, however the town-hall is of a different style of

* The following are the names of the trustees of the Almshouses:—Mr. Frederick Seager Hunt, chairman; the Venerable Archdeacon Jennings; Sir Henry Arthur Hunt, C.B.; Mr. John Lettsom Elliot; Mr. James Alfred Hallett; Mr. George Taverner Miller; Mr. Herbert Thos. Steward; Mr. Geo. Andrew Spottiswoode; Mr. Jos. Carter Wood; Mr. Edgar Horne; Mr. Wm. Goldsmith; Mr. Geo. Burt; Mr. Geo. Francis Trollope; Mr. Thos. John White; Mr. R. Selby Freeman; and Mr. William Mann Trollope, clerk and solicitor to the trustees.

architecture, dating from the early part of the sixteenth century. It has a tower, such as is found in similar buildings constructed about the same time. This structure seems to have been designed for judicial and municipal purposes alone, there being no provision for banqueting-rooms, &c., in its architectural arrangements. The custom seems to have sprung up about this time of building a hall for festivities close to the town-hall. The Luneberg building is, however, an exception in this respect. The town-halls of Göttingen, Einbeck, and Duderstadt were alluded to as being picturesque in their general plans. The town-hall of Hanover was referred to in special detail. One of the wings dates from the year 1435, and the façade towards the market-place from about 1470. The thirty years' war was injurious to the general prosperity of the district, and the town-hall was allowed to get into a condition which necessitated the restoration commenced in 1654. It had been proposed some twenty years ago to build a new town-hall, but at the urgent instance of the Union of Architects and Engineers the restoration of the old building was determined upon, the artistic success of the work being too well known to need detailed comment.

The Engineering Section was occupied with the discussion of the best means of regulating the stream in the case of navigable rivers, the treatment of the subject having special reference to the Weser. Professor Fränkel described his invention for indicating the tension of different parts of a building under various degrees of burden.

In the progress of the discussion as to the prevention of danger from fire in theatres, Herr Unger urged the necessity of a legislative basis for the regulation of architectural matters affecting theatres. Herr Giese pointed out that no progress of an important nature had been made of late years in the machinery of theatres. Further deliberations on the subject were entrusted to a select commission of delegates. Before the close of the Congress this body reported on the advisability of a proper code of rules being adopted by the German Parliament, which should be drawn up by technical authorities versed in the different branches most interested, such as architecture, stage machinery, theatrical arrangements in general, fire extinguishing, &c.

The engineering section was particularly active during the entire congress. The subject of the flexion of iron bridges was discussed with special reference to the periodical inspection of such structures for the purpose of avoiding catastrophes. The Central Union recently submitted a scheme for this purpose to eight different governments and fifty-five railway administration. The answers received (from about one-third of the companies thus addressed) show certain differences of opinion on the subject. One company has for years taken steps of a similar character to those recommended. Another thinks them too detailed, and only needful in the case of new bridges. Others have been themselves framing regulations on this subject, which will, in one instance, be replaced by the new scheme. Several companies express their appreciation of the plan, which they intend to adopt. The most suitable interval between these periodical examinations is thought by various administrations to be from three to five years, the latter term being specially applicable to small bridges. The methods of testing the flexion seem to be varied in their character, as also in the manner of applying the weight. Some companies employ an ordinary goods train, but in most cases two locomotives are placed with their fore parts together, and with goods trucks attached. A third engine is sometimes added, but in such cases it is empty. Many of the companies which have furnished such particulars precede the trials with moving weight by a test lasting five minutes with weight not in motion. A proposal made by Dr. Fritzsche, of Dresden, that the importance of uniformity in the tests applied should be represented to the various railway companies, was adopted.

An important paper was read by Professor Inze, of Aix-la-Chapelle, on the use of steel for building purposes, in which he attributed its limited employment to the reluctance of the profession to use a material the merits of which had not been fully ascertained. He alluded to the progress German steel manufacturers have been making of late years, and stated that exports have been made to England for Admiralty purposes. As to the application of steel to building purposes, he remarked that recent trials in England had resulted favourably, while the extra expense of steel against iron was, in some instances, of a relatively unimportant character.

The Congress was noteworthy for the important part which out-of-door work occupied in the proceedings. The various interesting architectural features of Hanover were the subject of special attention.

The visits paid to Brunswick and Bremen by the Congress were also of a highly interesting character, and amply repaid those whose zeal in the cause of professional science induced them to take these two railway journeys in addition to that which had to be undertaken in the first instance to reach the scene of the Congress itself. The usual festal adjuncts were not wanting at any of the points named.

In connexion with the Congress an exhibition took place of the plans sent in for the competition which recently took place for the building of the German Reichstag's new abode. This exhibition was numerously attended, not only by those who had come to the Congress, but also by the public at large.

THE BRITISH ARCHÆOLOGICAL ASSOCIATION AT PLYMOUTH.

RESUMING our notes * of last week's archæological congress at Plymouth, we proceed to go a little into detail as to Wednesday's proceedings, already briefly mentioned. The excursion for the day was to Dartmouth and Totnes. At Dartmouth, St. Saviour's Church was commented upon by Mr. Loftus Brock, who pointed out that the west end corresponded to the date of dedication, and that the east end corresponded to the time of Hawley. The main walls, however, appeared to be of an earlier date. The figures on the pulpit had been taken out, and the emblems and arms of Charles I. inserted. There appeared to be many dates scattered over the church, and the date of the ironwork on the south porch was much discussed, and generally agreed to have been inserted at the time of some repair. The handsome rood-screen was generally admired for the variety of its tints and intricacy of its workmanship. Mr. Brock directed the attention of the visitors to the altar-piece, by Brockedon, the Totnes artist. On the floor of the chancel the fine brasses were subjected to no small amount of scrutiny and impromptu observations offered by Colonel Bramble. On leaving the church the visitors proceeded to inspect the picturesque old houses in the Butterwalk. Sir James Picton was of opinion that they could certainly not be older than the reign of Elizabeth. Many of the visitors went to the castle, and a small section mounted the hill to see the old church.

The afternoon was devoted to Totnes, where the large granite pebble known as "Brutus's Stone" was inspected. Tradition alleges that on it Brutus of Troy landed, but Mr. Edward Windeatt, a local antiquary, did not appear to cherish a vast amount of respect for the tradition (the baselessness of which, if we mistake not, was demonstrated by Dr. Freeman some years ago), in spite of the fact that it has, for a long period, been customary to proclaim from this stone the accession to the crown of a new Sovereign. Thence the visitors wended their way to East-gate,—one of the four original gates, of which two only now remain. The East-gate, which has been much modernised, formerly consisted of two arched portals,—one for carriages, which was enclosed with gates, and a smaller one, "a needle's eye," for foot passengers. It was the room over the gateway, however, which most enchanted the spectators, there being there a beautiful specimen of the Early Renaissance in the form of a fine coloured carved frieze above the linen panelling, and surrounding the room. The frieze Mr. Brock took to be of sixteenth-century date, and of French or Flemish workmanship. Mr. Windeatt observed that this theory would correspond with the fact that about the time mentioned the merchants of Totnes had considerable dealings with the French and Flemish, and Mr. Brock added, that there was even now carried on a very considerable trade in old carvings from France and Flanders. At Totnes Church the first point that engaged attention was the fact that the fabric was built of red sandstone. It is curious that there is no other red sandstone building within five miles. The red sandstone in this case appears to have been brought up the river in boats,—a theory supported by the fact that in dredging large blocks of red sandstone have been found in the river. According to Mr. Windeatt, who acted as guide, the earliest notice of the existence of a church in Totnes is in a charter of Judhel de Totnais, the Norman Baron to whom the Conqueror granted the borough, by which he grants the church referred to in the charter as "ecclesiam Sancte Marie de Toteneo" to the great Benedictine Abbey of St. Sergius and St. Bacchus at Angers. The church appears to have been rebuilt, and the new one consecrated by Bishop Bronescombe in 1259. The church was again rebuilt about 200 years afterwards, Bishop Lacy, in 1432 granting an indulgence of forty days to all who contributed to the work. Over the outer doorway of the south porch are the remains of an ancient sun-dial, and what appears to have been three coats of arms. The higher one has the appearance of being the town arms. The inner doorway has over the remains of a saint's niche, and a shield with the arms of Bishop Lacy. About half-way up the fine old tower are three niches containing figures. The centre one is supposed to represent Bishop Lacy, and under the figure, in raised letters,—"I made the Tour." One of the principal objects of interest in the interior is the very handsome carved stone rood-screen under the chancel arch, with two parclose screens. It appears from some ancient documents, that in 38 Henry VI. an order was made by the Corporation (who up to 1836 had control of the church), that the chancel should be divided from the church with freestone, as the cathedral church at Exon was. This screen has recently been restored. The Corporation stalls, which are handsomely carved, were erected in 1636, and stood in front of the screen; they now face the entrance transept. In the south wall of the chancel is a hagioscope, and on the north side a fine rood turret, with stone staircase leading to the rood-loft; the base of the turret has the remains of two piscinæ. In the south aisle were noticed the remains of a Perpendicular tomb, to the memory of Walter Smith, who died in 1555. Under the tower arch is a marble monument to the memory of Christopher Blackhall and his four wives. It formerly stood on the south side of the chancel, but has been moved during the restoration to its present position, and Mr. Brock condemned the change in no measured terms. A kneeling figure, with hands clasped, represents the husband, who died in 1635, and beneath are the kneeling figures of his four wives. The restoration of the church had been conducted by Sir Gilbert Scott on such commendable lines that it was with some difficulty that Mr. Brock could bring himself to utter his censure. An adjournment having been made to the ancient Guildhall of the borough, where the visitors were cordially welcomed by the mayor (Mr. Edward Harris), an inspection was made of the old charters, seals, maces, cups, &c. From the Guildhall the visitors went to the castle of Totnes, which has a circular keep situate on a lofty mound.

On Thursday there was an excursion to the Tavistock and Lydford district. Arrived at Lydford Church, Mr. Brock remarked that its tower was altogether different from anything the Association had yet seen in Devon, and the plan was that of a very ancient building. Having examined the exterior, he found structural indications that the western part never formed a portion of the original building, and it was very possible that the original church consisted only of a simple nave and probably a small chancel. The western part was of the date of the south aisle itself. They had within the walls of this very simple little building evidence of how the growth of the church must have commenced thus from smaller things than we saw now. The tower was built some 2 ft. away from where the old western wall formerly existed. On the north side there were evidences of the outside jamb, the quoins being visible. The builders of the tower, like wise men, erected it so that it would not interfere with the services of the church. With respect to the age of the church, he would not venture to assign a date to the rough walling on the north side where the original wall commenced, because it might be of very great antiquity indeed. Taking the font, however, as evidence of its workmanship, it appeared to be of very early Norman date, but the researches

See p. 283, *ante*.

which had been made into our old fonts of recent years has shown us several fonts of Saxon date not at all unlike the one here. The windows on the north side of the church were insertions of about the middle of the fourteenth century. To the whole of the remainder of the church,—the beautiful western wall, and the south aisle,—they might assign the middle of the fifteenth century. The tower was particularly interesting, and he commended it to the special notice of the visitors. It was built entirely of granite, and the work was massive and good. The dilapidated condition of the roof Mr. Brock did not suffer to escape his attention, and suggested that it would give the custodians of the fabric some trouble before long. On leaving the church the visitors proceeded to Lydford Castle, where Mr. Worth, F.G.S., undertook to guide the party. There was, he said, no more suggestive site in Devonshire, because they had direct evidence in the earthworks that they were standing within the precincts of one of the great forts of the Damnonii. The church was dedicated to St. Petrock, one of the Saxon saints, which indicated that the origin of Lydford was very early. The castle was surrounded on all sides by valleys, and the point was one of the strongest that could be selected, the earthworks being the most formidable in the county. The place was of such importance in the Saxon times that a mint existed there, and there were in existence several specimens of pennies dating from Saxon times. Before Plymouth existed the Saxons came up and destroyed the mint at Lydford. Whether Lydford itself was destroyed they had no evidence, but its inhabitants must have rapidly recovered themselves if it was, because, in the reign of Edward the Confessor, there was only one town which surpassed Lydford in importance, and that was Exeter. In answer to inquiries, Mr. Brock said that probably much of the existing stonework only dated back as far as the time of King John.

At Tavistock the excursionists found a substantial luncheon awaiting them, provided by His Grace the Duke of Bedford. This having been partaken of, and the Duke's health toasted, the party adjourned to Tavistock Church, upon which some observations were offered by Mr. Brock, who said that the first date found in connexion with the church was 1184, when an important record was discovered which made it clear that the fabric existed in 1134, dedicated to St. Eustachius. The next date found was 1318, when the Bishop of Exeter dedicated the church, which had apparently been rebuilt at that time. He regretted with Mr. Rundle that many rare old documents had been destroyed, in one of which mention was made of a payment to the sacristan of the monastery. Here, as at St. Andrew's, Plymouth, remarked Mr. Brock, the architecture fitted in very badly with the dates. The south aisle he took to be the aisle of St. Thomas-à-Beckett. It was curious to find in the building occasional traces of the work of the fourteenth century. There was evidence that the church must have been all but remodelled a little later. The building itself exemplified all the points to which he had drawn attention as characteristic of Devonshire churches. There was no clearstory, there was the pointed barrel roof, the windows were broad and lofty. There was a chancel arch, which was a usual thing, and there was a western tower, which was a very unusual thing. At the east end they would see fragments of older work. Their experience led them to believe that in these western counties, when Saxon England was under a cloud of heathenism, there existed Christian churches. It was surprising to find that in Devon and Cornwall there were more churches dedicated to the older saints than were to be found in any other part of the country. Escorted by Mr. Brock, the visitors next proceeded to view the site and remains of a church which was probably as large as Exeter Cathedral—Tavistock Abbey. The extent of the space occupied by the buildings, cloisters, and courts had been ascertained from old rentals, in which a certain area is designated as the "Abbey Scite." The remains of the abbey, from the precincts into the gardens, orchards, &c., which probably were extensive, as considerable traces of ponds (perhaps the fish-ponds) were found when the foundations were being excavated for the houses now standing there. The old boundary-walls enclosing the abbey site,—those facing the river,—having a walk formed on it just below the battlements. A tower-like building of two stories at the south-west corner of the abbey, which has always been known as the Still House, was much admired, the upper story having been entered from the walk on the south boundary-wall. It has been much altered on the inside. The building now used as the Unitarian Chapel Mr. Brock thought to be undoubtedly the refectory. The stone niche or pulpit in the north wall, where the reader at the meal times of the monks was placed, was removed not a great many years since. The original roof still remains, hidden by the plastered ceiling, but the mouldings of the purlins and the ornamental portions of the principal timbers, which projected before the line of the circular ribs, have been cut away. Considerable attention was paid to the entrance to the refectory, with a groined ceiling of stone, and a chamber over, which was formerly approached by a circular stone staircase. This chamber had a handsome oak roof, with trefoiled principles, now much decayed. It is proposed to make a *fac-simile* restoration of roof. Passing on, Mr. Brock indicated the position of an oblong building, the last portions of which were removed about seventy years since, which had been considered to be the kitchen. From what Mr. Rundle had heard from old inhabitants it probably had at one time an upper story. The archway of the site of the watergate had been taken down within Mr. Rundle's remembrance. It was a low four-centred arch of granite, of about 8-ft. opening, and was shown in some old engravings of the remains of the abbey buildings. Formerly there was a ford across the river at this spot, the bridge and weir being of modern construction. Tavistock had, up to the middle of the last century, only two bridges across the Tavy. The east bridge (now destroyed), which was situate some distance above the abbey, and is shown in old engravings of the town as having several pointed arches; and the west bridge now existing, but much modernised, near Fitzford. Nothing of the interior of the upper story of the town gate is left, and the roof is modern. It must have been an apartment of considerable importance; the stone staircase, now taken away, was in the tower at the south-east corner. From what Mr. Rundle had seen at various times when excavations have been made in the road in front of the Bedford Hotel, he felt that he would not be far wrong in saying that there stood the abbey church. The arch, of Early English date, now standing in the churchyard might have been a part of the north side. Encaustic tiles have been found, forming portions of the floor, at about 7 ft. or 8 ft. below the present surface, and near the eastern end a large slab of stone was come upon which seemed to have formed the top of a tomb, and had an abbot's staff carved upon it. Pieces of white Beer stone, richly carved, which looked like portions of tabernacle work, have also been dug up. When old houses in the town, built about the middle of the seventeenth century, have been taken down, numbers of blocks of stone, parts of cusped tracery, foliated capitals of columns, and arched panellings have been discovered built into the walls. These are almost all of them Early English or Middle Perpendicular in style. There is a tradition that the chapter-house was where the present Bedford office is now placed. The outer walls were pulled down in the beginning of last century for the sake of the stones, which, it is said, were used for some erections, now part of the Bedford Hotel. In the construction of the abbey, granite was extensively employed for the pinnacles, windows, staircases, &c., but the bulk of the walls, all the squared ashlaring, much of the tracery of windows, carved caps of columns, and ribs and filling of the groining were made of a compact trappean ash stone, found about two miles from Tavistock. It was a very durable stone. In the more delicate work of the interior of the church a white stone, coming from Beer, was very extensively used, as evidenced by the quantities of pieces of finely-carved work which have at different times been dug up or found embedded in walls built since the dissolution of the monastery. Some of these were richly gilt and coloured.

At an evening meeting held on the return of the excursionists to Plymouth, Mr. J. Phillips read a paper on Abbotskerswell Church, in which it was stated that in the course of recent examinations of the church for the purpose of restoration, (which is about to be undertaken under the direction of Mr. Butterfield), there was discovered, beneath plaster and whitewash, a much mutilated figure or effigy, offering various points of interest and speculation as to its purport and date. For this latter, and comparing it with others, it may pass as contemporary with the later portion of the church, and a most singularly graceful and accomplished piece of sculpture it has evidently been. In height it stands about 7 ft. It is completely hollowed out at the back, so that there is now probably nowhere more than a thickness of 4 in. The stone may be Purbeck freestone, but Mr. Phillips thinks it is not unlike that which is raised near Amiens. The head has been encircled by a sculptured crown, with a fillet, in which are ornaments representing precious stones. From beneath the crown fall massive tresses of hair, brought out with unusual elaboration in the sculpture; also from beneath the crown depends a veil at the back. The robe falls in folds to the ground, and has been elaborately decorated, both in a light and also in a black pigment. The sculptured crown of the head has been for the most part cut away. Mr. Franks, of the British Museum, to whom a sketch was sent, could only compare it to the crown of Richard Cœur de Leon in the Cathedral of Rouen. The present position of the figure is very puzzling. It was suggested that at the rebuilding of the church by the abbot and monks of Sherborne, to whom the history of the Lady Œdelhild must have been familiar,—as the first mention of the parish is in a cartulary of their abbey, and concerning whom they probably had more information than has reached us,—they desired to commemorate the munificence of the royal lady who founded the church, which had become one of their benefactions.

The other papers read were on "The Antiquity and Antiquities of Plymouth," by Mr. Worth,—and as to which the Rev. W. Lach-Szyrma lamented the destruction of Old Plymouth,—and on a Plymouth hero, "Robert Blake, Colonel and General at Sea, 1657," by Mr. E. G. Bennett.

On Friday there was an excursion to Dartington, Berry Pomeroy, and Compton Castle. Dartington Hall, the seat of Mr. Arthur Champernowne, was first visited. Mr. Brock pointed out that the plan of the building was like most of the Domestic houses of the period. It consisted of two quadrangles. The larger of the two, the remains of which still exist, had the domestic offices on both sides of it. The second quadrangle was smaller, and consisted of the best apartments. The work that remained was undoubtedly of the time of the rebuilding of the hall by John Holland, Duke of Exeter, the style being the Transition from the Decorated to the Perpendicular. The mullioned and transomed windows in the tower were no doubt Elizabethan insertions; and the battlements and some of the corbels beside the tower were, he understood, rebuilt by Pugin some years ago.

Berry Pomeroy Castle was treated of in a paper read by Mr. Lynan, who stated that the structure was of the Edwardian period. Mr. Myers spoke of the care which was evidently taken of the ruin by its owner, the Duke of Somerset.

At Compton Castle attention was called to a paper by Mr. Gordon Hills in a past volume of the *Journal* of the Association.

At the evening meeting in Plymouth an interesting paper on "The Old Cornish Tongue and its Remains" was read by the Rev. W. S. Lach-Szyrma.

On Saturday there was a carriage excursion to Slade Hall, Cornwood Church, Fardel, near Ivybridge, and Plympton. At Slade Hall extracts from Risdon's "Survey of Devon" were read appertaining to the building and to Fardel.

Cornwood Church was described by Mr. Brock as one of the most instructive churches to study which the visitors had seen during their tour. I think (he went on to say) we may trace here the gradual development of the church plan from a building comparatively small to one of the present size. The nave I take to be the original form of the church, with, as in this case, the addition of a western tower. The western tower survives; but nothing of the little nave remains. The tower, therefore, of this church is the oldest part; and it is of early date, say,—for the purpose of fixing a date,—A.D. 1160 or 1170. The work is, therefore, semi-Norman in its character, the belfry windows being semicircular-headed, and the little tower arch pointed. The remainder of the building, like so many of the Devonshire

churches, is in the Perpendicular style. I can scarcely trust myself when I find flowing Decorated windows in the walls. They are modern, like so many other portions of the building. The pillars between the aisles and nave are very curious, built of granite, and one stone forming each shaft. Following the usual arrangements of these Devonshire churches the older parts are built of rag stone, and the later parts of granite. There are some pretty monuments here. I am glad also to find that the old Jacobean or Elizabethan pulpit has been retained, and a very pretty example it is.

At Fardel, Mr. George Wright read a paper discussing the question whether Sir Walter Raleigh was born at Fardel. He said:—We are now looking upon a spot where much of his early life was passed, and the associations connected with his name become all the more vivid, and the picture, as it were, of the great past in which he was so intimately concerned rises before us. Lysons, in his "Magna Britannica," says:—"Fardel was, in the reign of Henry II., the property of Warren Fitz-Joell, whose heiress brought it to Newton, and the heiress of Newton to Raleigh, of Smallridge. The manor belonged, in the reign of William the Conqueror, to Ralph de Pomeroy, and afterwards to the Mohuns. In the reign of Henry III. it became the property of Wymand Raleigh, a younger son of the Nettlecomb family, an ancestor of Sir Walter Raleigh, whose grandfather, Wyman Raleigh, conveyed the manor to Sir Nicholas Hyde, Chief Justice of the King's Bench. Fardel was one of the principal seats of the Raleighs, and it was supposed, though erroneously, that the celebrated man of whom I have been speaking was born there. Fardel was, without doubt, his occasional residence. His father was the first of the name that lived there. A letter from Sir Walter Raleigh to one of the Duke family was, a short time since, to be seen at Ullerton House, pasted on a little board for its preservation, with a glass over it. East Budleigh, Poer Hayes, since called Duke's Hayes, was the property and residence of the ancient family of Poer, whose heiress brought it to the Dukes. The old mansion at this place is celebrated, says Lysons, as the birthplace of Sir Walter Raleigh, whose father had a long lease of it under the Dukes, and here, in 1552, the celebrated Sir Walter Raleigh was born. In the letter referred to, dated from the Court, July 26th, 1584, addressed to one of the Dukes' family, he expresses his wish to purchase this place, observing that from the natural disposition he had to it, having been born in the house, he would rather seat himself there than anywhere else.

From Fardel the company drove to Ivybridge, and dined together at Mallet's Hotel. On the return journey to Plymouth a halt was made at Plympton, and a couple of hours agreeably occupied in inspecting the old castle and the two churches of St. Mary and St. Maurice, Mr. Brooking Rowe giving an interesting address in reference to the origin and probable date of the castle ruin, and the chief architectural features of the two churches. A brief visit was paid to the Plympton Grammar School, the birthplace of Sir Joshua Reynolds, and also the place where the two other eminent artists, Sir Charles Eastlake and Benjamin Robert Haydon, received their early education.

On Monday last, Port Eliot, St. Germans, and Trematon Castle were visited.

UNWRITTEN HISTORY:

HOW TO READ IT.

THIS was the subject of an interesting discourse given in the Skating Rink, Southampton, last week, by Dr. John Evans, F.R.S. It was a lecture addressed to the townspeople, and attracted a crowded audience.

Dr. Evans commenced by expressing his approval of the custom, observed now for some years, for one of the members of the association to be deputed to deliver a lecture to the operative classes. Such an occasion afforded a good opportunity of treating some subject which lay within the range of all observers of what was going on in the world and which might be of local interest. It was not easy to find such a subject; yet if he spoke of those who in remote times had lived and laboured in this part of the globe, he should have a theme of general human interest. If, in addition to giving particulars of their mode of life, he pointed out the methods by which our knowledge of the manners and customs of remote antiquity was obtained, he should assist his hearers to appreciate the value of the application of scientific methods to the study of the past, and to feel that our knowledge of antiquity rested upon something more secure than vague conjecture. The neighbourhood was the home of some of the witnesses he would call. Our best evidence of what must have been the condition of occupants of the earth without the most simple appliances of modern civilisation was to be found in the relics of the past found buried in the earth. The town was formerly known as Hamtune, and Northampton had the same name; and North and South were prefixed for distinction. Ham was home, and Tune was probably derived from the name of the river in each case. Going back beyond the Roman occupation of the island we entered the border of the domain of unwritten history. The ancient Britons had coins; particular forms had been found in particular districts; the inscriptions on some determined the names of British princes and the districts in which they reigned. In Hants and Sussex were found coins struck by two princes as to whom written history was silent. In the southern counties, and especially in Kent, coins had been found which were, no doubt, imitations of those made by Philip, the father of Alexander the Great. There was evidence of an uninterrupted succession of coins copied the one from another. The coins justified us in saying that the Southern Britons were sufficiently civilised to make use of a coinage 150 B.C., or a hundred years before Cæsar came. Besides coins of gold, silver, and brass or copper, with devices derived from Gaulish copies of a Macedonian original, there were others cast in tin with devices in imitation of some coins of Marseilles. Many of these had in relief the grain of the wood in which they were cast. They had been found with iron tools and weapons near Lewes. In graves which must have belonged to the first few centuries before Christ there had been found swords of iron, with ornamental bronze sheaths. It was the custom to bury with the dead a number of ornamental or useful objects, and in graves in the Austrian Tyrol had been found swords with hilts of ivory inlaid with amber, daggers with golden sheaths, helmets, girdles, bracelets, brooches, and vessels of bronze. In other graves have been found swords, spear-heads, and hatchets of bronze, of which the iron weapons appear to be imitations. It was inferred that the bronze weapons must have been in use when iron was introduced as a substitute. The terms, "iron age," "bronze age," "stone age," meant certain stages of civilisation, the chronological periods of which would vary in different parts of the world. It was not known when it was discovered that an admixture of tin made copper harder and more fusible, but the discovery was made independently in the New World, for some of the weapons and tools of Peru, made before there was any contact with Europeans, were of bronze of the ordinary composition. The bronze period of Britain was well illustrated by relics (representations of which were shown on the wall). There were swords, spear-heads, daggers, shields, chisels, gouges, and hatchets or axes. In the lest-named weapons the gradual development of the socket from the flat blade was traced in curious detail, and the conclusion was drawn that the art of casting hatchets with a socket was introduced into this country from abroad. The bronze-using people were skilful both in founding and in the manufacture of ornaments, and a dagger had been found in Wiltshire as delicately inlaid with gold as any ornament of our own time. But man's history in this stage might be better read on the Continent than at home. In Switzerland, Italy, and the South of France the foundations had survived of the artificial islands carried on piles above the water which the men of those days built to protect themselves against their enemies or wild animals. Those men were hunters and fishermen; to some extent too they were husbandmen, and reaped their corn with sickles of bronze. They made vessels of clay, they could spin and weave both linen and woollen cloth, they possessed domesticated animals,—the dog, ox, sheep, goat, and even the horse. Besides bronze, they used flint for their weapons and other appliances. The number and varieties of instruments of that metal found in Britain seemed to carry us back to 1200 or 1400 B.C. as the beginning of the bronze period. But the flint arrow-heads and scrapers and the use of stone for battle-axes carried us back to a still earlier chapter of unwritten history. It was astonishing that men in so low a stage of civilisation should have been able to furnish themselves with so many and such perfect appliances made of stone,—hatchets and adzes of flint, with carefully ground edges, hollowed chisels, drills, hammers, knives, and saws. The presence of spindle-whorls,—the small fly-wheels by which hand-spinning is carried on,—proved that the art of spinning was known, and charred fragments of woven garments had been found in the lake dwellings of that primitive time. Wheat, barley, and millet, too, were cultivated, and the apple and pear were not only eaten, but stored up for winter consumption. It was impossible to trace the beginnings of that Neolithic period, as it had been called, although we might fix within some centuries the time at which bronze began to supersede stone as material for the most necessary utensils of life. But the circumstances under which the implements of those days were found proved that the general physical features of the country, the alternation of hill and dale and the beds of streams, were much the same as they are in the present. In the facts which he had mentioned there was little to prove the inaccuracy of the popular chronology which fixed the creation of the world about 6,000 years ago. But within the last twenty years a mavellous vista of antiquity had been opened out to us by the researches of geologists. The drifted deposits of the Test and the Itchen, and more strikingly those of the Avon, which joined the sea at Christchurch, proved that the earth was many times older than she had formerly been supposed to be. Some of those drift beds were as much as 90 ft. or 100 ft. above the existing river, and it must have required an enormous amount of time to scoop out channels of such a depth. The discovery also of the bones of the elephant, rhinoceros, hyæna, lion and reindeer, of the pouched marmot, and the Greenland lemming, pointed to climatic conditions as diverse as could well be imagined from those under which we now lived. At Southampton itself there were beds of old gravel capping the hill at the common, 150 ft. above the sea level, and yet the top of that hill must at one time have been a valley surrounded with hills. Thus the aptness of the comparison, "as old as the hills," was lost, for,—

> "The hills are shadows and they flow
> From form to form, and nothing stands,
> They melt like mists, the solid lands,
> Like clouds they shape themselves and go."

The Stone Age was divided into two periods. That which he had been describing was called the Surface Stone or Neolithic Period, while the earlier times had been designated the Paleolithic or Ancient Stone Period. The implements of the earlier era were of ruder construction, and never had their edges ground. These implements had been generally found in the river drift, whence arose the term, the "River Drift Period." Yet a great gulf of time was fixed between these two periods. There was little doubt that the gravels which now capped Hengistbury Head, Barton, and Hordle, 100 ft. above the sea, were originally deposited in the bed of a river which flowed in an easterly direction, and that the Needles at Alum Bay were the shattered and seaworn remains of an extension of the great chalk ridge of High Down, westward from Freshwater. There must have been a time when the chalk downs of Dorset and of the Isle of Wight formed one continuous ridge, and the island was not separated from England by any arm of the sea. In those days, the rivers at Poole, Christchurch, Lymington, and Exbury must have contributed to form one river flowing from east to west, which, in the course of time, had widened out until it became the Solent Sea and Spithead. Thus he had shown, though necessarily in an imperfect manner, that the history of man might be carried so far back into a dim past; and even Egyptian chronology, extending as it did over thousands of years, appeared but to cover a small link in the chain of human existence.

South Hampstead Working Men's Club. We note that the designs of Mr. Frederic A. Gosling, of 148, Hampstead-road, London, were selected in competition for the new club-house for above, which is about to be erected on the Fleet-road, Hampstead.

DRUMLANRIG CASTLE.

IN 1842 Queen Victoria visited Dalkeith Palace, the Midlothian residence of the Duke of Buccleuch and Queensberry; in 1882 her Majesty does a like honour to Drumlanrig Castle, another of that nobleman's Scottisb residences.

Drumlanrig was built by William, first Duke of Queensberry, who was as hateful to the Scottish Covenanters as he was acceptable to Charles II. It was commenced in 1679, and if reliance can be placed on the dates carved on the various portions of the fabric, occupied ten years in building, and so great was the outlay, that the duke wrote upon the bundle of accounts connected with its erection, a sort of denunciation of any of his posterity who should attempt to discover the extent of his folly,—the diction of the curse is strongly characteristic, though far from elegant:—"The deil pyke oot his een [the devil pick out his eyes] that looks herein," and only for one night did he occupy the mansion that acquired and long retained the name of "The Duke's Folly." Drumlanrig, in consequence of its resemblance to Heriot's Hospital, Edinburgh, is said by the guide-books to be work of Inigo Jones. Who was the architect of Heriot's Hospital (1628—60)? is a question that has never been answered, and Jones died in advanced age nearly thirty years before Drumlanrig was commenced.* Any one searching among the records of bygone English architects will find that Colin Campbell† designed the fabric, and any one visiting the churchyard of Durisdeer, the parish in which Drumlanrig stands, will find there a monument commemorating "James Lukup, master of works at Drumlanrig," dated 1685; he is represented in a wide-skirted coat buttoned up the sides of the skirts, and having very large cuffs, also buttoned, with a cravat hanging down his breast, and with a broad Lowland bonnet (Tam-o-Shanter), from beneath which his hair descends in full flow upon his shoulders.

Defoe, in his "Tour," writes "Drumlanrig is like a fine picture in a dirty grotto, or an equestrian statue set up in a barn. It is environed with mountains which have the wildest and most hideous aspect of any in all the south part of Scotland." Then follows a description of the building, which is better rendered by Pennant, who visited the spot fifty years afterwards:—"A square building extending 145 ft. in front, with a square tower at each corner, and three small turrets on each; over the entrance is a cupola, whose top is in the shape of a vast ducal coronet; within is a court, and at each angle a round tower, containing a staircase; everywhere is a wearisome profusion of hearts carved in stone,—the Douglas arms,—every window, from the bottom to the third story, is well secured with iron bars; the two principal doors have their grated guards, and the cruel dungeon was not forgot; so that the whole has the appearance of a magnificent state prison. . . . . The apartments are numerous. The gallery is 108 ft. long; it is ornamented with much of Gibbons's carving and some good portraits," and hereby hangs a tale.—*London Gazette*, Dec. 31, 1745. "Dumfries, Dec. 24. On Saturday last, the 21st, and the day following, the main body of the rebel army came into this place with the Pretender's son: on Monday morning he marched from hence with them, and proposed to lodge that night at Drumlanrig. They shot a tenant of the Duke of Queensbury's for running out of their way and not returning quickly enough at their call," &c.; that same night the rugged highlanders bivouacked in the great gallery, and with their broadswords nearly hacked in pieces the portrait (a royal gift) of William III., to mark their detestation of "the Glencoe affair." Sixty years ago the interior of Drumlanrig was in a sad state of disrepair, and the furniture was very meagre and dilapidated. The State chair of the early dukes and duchesses and the family portraits were the only representatives of the former pride and grandeur; but in the autumn of this present year her Majesty, travelling through Nithsdale, famed in song and story, will see the mountains, not frowning upon Drumlanrig with "wildest and most hideous aspect," but smiling in garments of purple heather and many-tinted foliage; the iron bars have long been removed from the windows and the grim gratings from the doors; "the appearance of a magnificent state prison" has changed to that of a palace; from the walls of the gallery William III. (completely restored from his encounter with the M'Donalds) and his consort Mary, and Queen Anne with her consort George Prince of Denmark, look no more on tattered tapestry and cobwebbed carvings, and the gardens that found favour in the eyes of Pennant, and reminded Defoe of Chatsworth, with their arbours and stately hedges and banks of flowers, are as pleasant and trim as when the wife of the third Duke of Queensberry, Catherine Hyde, "Kitty ever bright and young," paced the terraces listening to one who long enjoyed her patronage and friendship, telling how from a London 'prentice he became a London poet, and wrote "The Beggars' Opera."

* Mr. John Hill Burton, in his "History of Scotland," vol. vii., claims it as the work of Sir Robert Aytoun, but he gives no proof. "Mr. Walter Balcanquell, Doctor in Divinity and Master of the Savoy," by the terms of Heriot's will, furnished the plan. Arnot's "History of Edinburgh" is responsible for the Inigo Jones story.

† See *Builder*, August 12, 1882, p. 204, note.

ON CRESSET STONES.

A PAPER on this subject was read at the Royal Archæological Institute, Carlisle, by the Rev. T. Lees, M.A. Mr. Lees said:—

A cresset was a cup of earthenware or metal, fastened to the top of a pole, and containing a light, and so forming a portable lantern. When the pole was fixed in the earth, and so became a stationary light, the whole apparatus was styled a beacon. In heraldry, the beacon was the badge of Henry V., and appears on the frieze within the chantry over his tomb in Westminster Abbey. The Harleian MS. 104, says,—"The cresset with burning fire was the badge of the Admiralty"; and Mr. J. R. Planché, in explaining this assertion, writes that it was probably "founded on the fact that the badge of John Holland, Duke of Exeter, was a cresset. . . . . The cresset of the Hollands, Earls of Kent and Dukes of Exeter, was probably derived from the lordship of Wake, such lights being carried by the watch of the Middle Ages; and the motto of the Wakes of Somerset being still 'Vigila et Ora,'—'Watch and Pray'" ("Pursuivant of Arms," p. 251). The Marquis of Northampton bears for his first crest "on a mount a beacon fired."

But we are concerned at present not with the heraldic use of the cresset, but with the ecclesiastical; for cresset stones, so far as any evidence has yet appeared, were used only in churches and monasteries.

Dr. Johnson (vol. i., 4to, 1786) defines a cresset as "a great light set upon a beacon, light-house, or watch-tower;" and gives the derivation from the French "*croissette*, because beacons had crosses antiently on the top." In his anxiety to give a plausible derivation the good Doctor has made more than one mistake. The old French for a "little cross" is *croisette* with one *s*. The word *croissette*, with two *ss*, which he uses, means, "a slip of vine for planting," and is derived from *crescere*, to grow. This idea that "cresset" is connected with the word "cross" is not borne out, so far as my knowledge goes, by any example of a cresset surmounted by a cross. The cup containing the light or fire forms the top of the instrument, and has nothing above it. These fire-cups were themselves the cressets apart from the handles to which they were fixed. So we find in the "Rites of Durham" (Surt. Soc., pp. 2, 3), in the description of the St. Katherine window:—"And in the said window was there a frame of iron wherein did stand nine very fine cressets of earthen mettall filled with tallow, which every night was lighted when the day was gone, to give light to the nine altars and St. Cuthbert's Ferriture in that part, and over all the church besides, did burne unto the next morninge that the day was broken."

This application of the word "cresset" to the cup containing the light brings us to the derivation of the word. *Cresset* is the middle English word for a cup or vessel containing light fixed on the top of a pole, and comes to us through the old French *crasset*, a cresset; *croiset*, *creuset*, a cruet, pot, crucible (with which last word it seems most reasonable to ally it), from the Old Dutch *kruyse*, a cup or pot. This account of the derivation I owe to Professor Skeat's most valuable "Concise Etymological Dictionary of the English Language," and I believe it contains the true lineage of this much-disputed word.

From the cup, metal-pot, or crock, the word cresset was transferred to a cavity hollowed out in a stone, in which a light was burned. Hence the stones containing these cavities are called "Cresset Stones." There were three of these in the church and monastery of Durham, and we find them described in the "Rites"; one was in the church itself, and the two others in the dormitory. The account of the first runs thus:—"Also there is standinge on the South pillar of the Quire doore of the Lanthorne, in a corner of the same pillar, a foure squared STONN, which hath been finely wrought, in every square a large fine image, whereon did stand a foure-squared stone above that, which had twelve cressetts wrought in that stone, which was filled with tallow, and every night one of them was lighted, when the day was gone, and did burne to give light to the monkes at midnight, when they came to mattens." The description of those in the Dorter or Dormitory is as follows:—

"In either end of the same Dortor was a four [fair, *Dao*] square stone, wherein was a dozen cressets wrought in either stone, being ever filled and supplied with the cooke as they needed, to give light to the monks and novices, when they rose to their mattens at midnight, and for their other necessary uses."

From the above extracts we learn that the cressets in this case named were not earthenware or metal cups *standing on*, or *inserted in*, the stones, but the actual hollows themselves "wrought" in the stone. This, I trust, will prove to you the fitness of the word which heads this paper to describe these simple *Instrumenta Ecclesiastica*. At a meeting of the C. & W. A. A. S. held at Furness Abbey, August 7th, 1877, I read a paper on the "Probable Use of Certain Stones found in the Ruins of Calder and Furness." Two of these stones are undoubtedly cresset stones; and since the appearance of that paper I have received information regarding such stones from various quarters. Sir Henry Dryden has shown the greatest interest in the matter, and it is at his suggestion, and encouraged by his advice and kindly assistance, that I now venture to present this subject to the notice of the Institute. The following list contains particulars of all the examples yet brought to my notice. The Swedish ones I know are called "Holy Water Stones," or "vats," but this term seems misapplied.

After describing a number of examples known to him, the writer thus concluded:—

Sweden, Other Examples.—Besides the above four stones at Stockholm, there are, I find, letters published from Mr. J. Romilly Allen, which mention more Swedish examples of these interesting relics. (1) One at the church of Strio, in the diocese of Sund, of five holes, forming the cushion cap of a pillar, and somewhat like the Sewanick stone. (2) Another which was originally in the church of Nobbelop, also in Sund. "It has," says Mr. Allen, "six cups arranged in two rows, and measures, 17 in. by 13 in., being supported on a pillar of 3 ft. high."

On what ground these Swedish stones are called "vigvattens-sten," holy-water vessels, I know not. I know of no instance where a holy-water stoup is divided into different compartments. Why should it be? One large stoup or basin would serve the purpose far better than a stone block of equal dimensions, hollowed out into a series of cups. For what object these stones were used in England has, I trust, been made clear by the extracts from the Durham "Rites"; and the soot and fire stains on some of them strongly confirm the correctness of the conclusion that these stones have been simply blocks in which lights were burnt, for the convenience of the ecclesiastics at the night offices of the church, or for domestic use in their dormitories. How far their use extended to the lay-folk we have at present no means of judging.

It does not seem as if any symbolical meaning were attached to the number of cressets in each stone; for we find these numbers varying, sometimes three, sometimes five. Six seems a favourite number, and sixteen (in the Calder stone) the highest number yet known. From the "Notes from the Muniments of St. Mary Magdalen College, Oxford, from the Twelfth to the Seventeenth Century," by D. W. Macray, we learn that in 1365 "a cresset with fifteen holes and four lamps" was maintained in the Church of Chalgrove, Oxon.

The examples brought before you in this paper all belong to Mediæval times; but is it not probable that our forefathers of the Middle Ages derived their use of hollowed stones for

light-holders from still earlier times? May it not be that the discovery of the use of cresset stones is a step (and a long one) towards the elucidation of the purposes to which those cup-marked stones were put, which have formed so long a puzzle to the pre-historic archæologist?

THE PRIMARY COLOURS.*

OF all the interesting phenomena concerning colour, resulting from recent scientific researches, probably the hypothesis that red, green, and violet are the three primary colour sensations attracts most attention, because of its apparent antagonism with the fact that red, yellow, and blue are the three primary colours of pigments.

All colours are really sensations, caused by the action of light on one of the divisions of the retina, the so-called layer of rods and cones. It has only recently been discovered, however, by Professor Max Schultz, that both the rods and the cones have each their peculiar function, and though probably both serve as elements of light, it is more especially the function of the rods, whilst the perception of colour is due, possibly exclusively, to the cones. These cones appear to be divided into three sets: one set, being stimulated by the strongest vibrations of light, produces the sensation of red; another set, acted upon by the vibrations of medium strength, produces green; and the third set, responding to the short and weak vibrations, produces the sensation of violet. Red, green, and violet are, therefore, termed primary colours. Intermediate vibrations affect two sets of cones simultaneously, and, consequently, produce compound or secondary colours. Upon the three sets of cones being excited together, in their proper proportions, the sensation of white is the consequence. If this theory be true, we may assume the existence of a colour-sense wherever we find the cones, and to mark it absent wherever they are absent. . . .

I have shown that the primary sensations of colour,—red, green, and violet,—cannot be produced by the combination of any of the other colour-rays of white light, but that conversely all the other sensations of colour are obtained by these three colours in different proportions. The same may be said of the primary colours of pigments. Red, yellow, and blue cannot be produced by the mixture of other colour pigments; but these colours are capable of producing by admixture almost all other colours. It will be at once evident that the colours of each set are different, the primary green and violet sensations being substituted by yellow and blue as primary colour pigments; and this substitution causes one to inquire whether the remaining primary of light, red, is of the same hue as the primary pigment of that name? It is here desirable to point out the very general idea the names of colours convey to the mind. When we say red, what do we mean? The term red is often applied to a colour that may be almost orange on the one side or violet on the other, green, commonly speaking, may be almost yellow or blue, violet may mean almost pink or blue. I consider that there is as much difference in the primary red of the spectrum and the primary red pigment as there is between the green light and the yellow pigment, or between the violet light and the blue pigment.

Now the primary red of light is a scarlet red; indeed, in some works the term scarlet has been applied to it. The green light is more inclined to yellow than blue, and the violet light is a decided blue violet, and has been named blue by some writers. In pigments we find that the primary colours are the reverse of this. The best red pigment for the mixture with the greatest number of other colours is a crimson red; the best yellow is more inclined to orange than blue; the best blue is of a green hue. When these pigment colours are lightened by the addition of white, there is obtained, perhaps as near as it is possible to obtain with pigments, the secondary colours of light. It would thus appear that the colours which were formerly considered primary colours, are really the secondary colours of light, and therefore, though red, yellow, and blue may be the primary colours of pigments, they are certainly not primary colour sensations caused by the vibrations of light.

* From a paper by Mr. G. H. Morton, jun., read before the Literary and Philosophical Society of Liverpool.

THE FORTH BRIDGE.

IN Section G (Mechanical Science) of the British Association meeting at Southampton, Mr. B. Baker read a paper on the Forth Bridge, in which it was stated that the report of the Anthropometric Committee showed that the average stature of a new-born infant was 19·34 in., while the average height of the Guardsman sent out to Egypt was officially given at 5 ft. 10½ in. These figures had a ratio of 1 to 3·65, and as the largest railway-bridge in this country,—the Britannia Bridge,—had a span of 465 ft., and the Forth Bridge a span of 1,700 ft., the ratio there was also 1 to 3·65. Hence to enable any one to appreciate the size of the Forth Bridge the following simple rule-of-three sum was suggested:—As a Grenadier Guardsman is to a new-born infant so is the Forth Bridge to the largest railway-bridge yet built in this country. Bridges a few feet larger in span than the Britannia had been built elsewhere, but they were baby bridges after all. It was not the physical features of the country, but the habits of the population that rendered the construction of a 1,700 ft. span expedient. The Act for constructing a bridge at Queensferry across the Forth was obtained in 1873, and the contract for the construction of Sir Thomas Bouch's great suspension-bridge in two spans was made, the preliminary works being in progress when the Tay Bridge fell. In consequence of the latter disaster, the directors of the Forth Bridge Company decided not to proceed with the works, and an Abandonment Bill was promoted in the Session of 1881. Different railway companies, interested in securing direct communication with the North of Scotland, objected to the abandonment of the enterprise, and instructed their consulting engineers, Messrs. J. Fowler, Harrison, and Barlow, to report anew on the practicability and cost of crossing the Forth by a bridge or otherwise, at Queensferry or elsewhere. A careful reinvestigation of the whole question was accordingly made, with the result that the directors were advised that it was perfectly practicable to build a bridge across the Forth which would comply with the requirements of the Board of Trade and public safety, and that the best place of crossing was Queensferry. The Abandonment Bill, which had passed the Commons, was then withdrawn, and the engineers were instructed to agree on a design. Modifications of the original suspension-bridge were then considered, and Mr. Fowler and the writer of the paper submitted a project for a bridge on the continuous-girder principle. Messrs. Harrison and Barlow, fully appreciating the advantages which would pertain to such a bridge, as compared with a more or less flexible suspension bridge, made independent investigations, and suggested several modifications, and finally the design, a model and plans of which were now before the meeting, was unanimously agreed upon by all to be recommended to the directors for adoption. The directors acted upon this recommendation, and the necessary plans were deposited, and an Act obtained this year for constructing a continuous-girder bridge across the Forth at Queensferry, having two spans of 1,700 ft., two of 675 ft., fourteen of 168 ft. and six of 50 ft., and giving a clear headway for navigation purposes of 150 ft. above high-water spring tides. For this work Mr. Fowler and the author of the paper were acting as engineers. Every one, probably, would concede that a girder-bridge would prove stiffer than a suspension-bridge, but it was not so obvious that it would be cheaper. Careful comparative estimates had, however, proved this to be so in the case of the Forth Bridge. Having explained the reasons which induced the engineers to fix on the length and width and other matters connected with the design of the bridge, the paper stated that the superstructure would be of steel. For the tension members the steel used was to have an ultimate tensile strength of not less than 30 tons, nor more than 33 tons per square inch, with an elongation of 20 per cent. in a length of 8 in. For the compression members the strength was to be from 34 tons to 37 tons, and the elongation 17 per cent. In making the tubes and other members, all plates and bars which can be bent cold were to be so treated, and where heating was essential no work was to be done upon the material after it had fallen to a blue heat. The steady pressure of hydraulic presses was to be substituted for hammering where practicable, and annealing would be required if the steel had been distressed in any way. Having given details in reference to the bridge compared with others, the paper stated that no special difficulty would arise with respect to the foundations. The total length of the great continuous-girder was 5,330 ft., or, say a mile, and of the viaduct approaches 2,754 ft., or rather over half a mile. The piers would be of rubble masonry, faced with granite, and the superstructure of iron lattice girders, with buckled-plate floor and trough-rail bearers, as in the instance of the main spans. The main girders spaced 16 ft. apart would be placed under the railway, and there would be a strong parapet and wind-screen to protect the trains. About 42,000 tons of steel would be used in the superstructure of the main spans, and 3,000 tons of wrought-iron in that of the viaduct approach. The total quantity of masonry in the piers and foundations would be about 125,000 cubic yards, and the estimated cost of the entire work upon the basis of the prices at which the original suspension-bridge was contracted for, was about 1,500,000*l.*, though, owing to the magnitude and novelty of the undertaking, the estimate must be taken as approximate only, as a contract had not yet been concluded for the works.

A NEW PAINTING FOUND AT POMPEII.

MR. EUSTACE NEVILLE ROLFE, in a letter to the *Times*, dated Naples, August 23rd, says:—"An important painting has been found at Pompeii, and was yesterday placed in the Naples Museum among the Pompeian frescoes. It represents the judgment of Solomon, and is the first picture on a sacred subject, the first fragment either of Judaism or Christianity, that has been discovered in the buried cities. The picture is 5 ft. 6 in. long, and 19 in. in height, and is surrounded by a black line about 1 in. in width. The scene is laid upon a terrace in front of a house adorned with creeping plants, and shaded with a white awning. On a daïs (represented as being about 4 ft. high) sits the king, holding a sceptre, and robed in white. On each side of him sits a councillor, and behind them six soldiers under arms. The king is represented as leaning over the front of the daïs towards a woman in a green robe, who kneels before him with dishevelled hair and outstretched hands. In the centre of the court is a three-legged table, like a butcher's block, upon which lies an infant, who is held in a recumbent position, in spite of his struggles, by a woman wearing a turban. A soldier in armour, and wearing a helmet with a long red plume, holds the legs of the infant, and is about to cleave it in two with his falchion. A group of spectators completes the picture, which contains in all nineteen figures. The drawing is poor, but the colours are particularly bright, and the preservation is excellent. As a work of art, it is below the average Pompeian standard, but it is full of spirit, and drawn with great freedom. The bodies of the figures are dwarfed, and their heads (out of all proportion) large, which gives colour to the assertion that it was intended for a caricature directed against the Jews and their religion. This may be so, but my own impression is that the artist was anxious to develop the facial expression, and, to do this, exaggerated the heads. There is nothing of caricature about it in other respects."

AN ANCIENT BUILDING CONTRACT.

AT a recent meeting of the Berlin Archæological Society, a description was given by Herr Curtius of a stone tablet which had been discovered in April at the Piræus, containing details of the contract entered into for building a house intended for the reception of naval stores, &c. The details show that at the early period in question the Greeks were careful in such matters. Provision seems to have been specially made for openings in the walls for purposes of ventilation.

The Traffic of Regent-street and Pall Mall is suspended in consequence of the streets being paved by the Asphaltic Wood Pavement Company, Limited. The company has also been entrusted by the Corporation of Leeds with the contract for the repaving of St. Paul's-street and Aire-street in that town.

THE LATE MR. EDMUND WALKER.

I HAVE looked in vain for an obituary notice in your journal of the late Mr. Edmund Walker, of Maitland Park, N.W., an artist well known to architects, many of whom will be sorry to learn he passed away on July 9th, aged 68. To his skill in water-colour drawings not a few of the leading architects of present and past days have been indebted for his highly-artistic rendering of their perspective outlines; and they could always rely upon him for rapidity as well as excellence. His professional career is full of historical interest. Some forty years ago he had a lucrative practice in miniatures on ivory, and was well supported. The Daguerrotype process, followed by photography, destroyed that connexion. He then visited many of the country seats in England, Chatsworth amongst the rest, and made local and finished drawings of the mansions, whose owners readily purchased them. Prior to 1851 he became connected with the then firm of Day & Son, and executed all those noted large interiors of the Great Exhibition of that year, first in water-colours and afterwards in chromo-lithography. On his judgment and taste the late Sir Joseph Paxton, Sir Digby Wyatt, and Owen Jones largely relied for the effective placing of the principal objects in that exhibition; and the late Captain Fowke engaged him for similar drawings for the 1862 Exhibition; but those were not published.

He was commissioned to paint the Opening Ceremony of the Horticultural Gardens, but as the Queen was prevented being present the picture passed into the hands of the Baroness Burdett-Coutts. The first water-colour drawings of the Thames Embankment exhibited by Mr. Bazalgette in the Royal Academy, which all who then saw them will doubtless well remember, were by Mr. Walker, and it was not uncommon in those days for his work to be seen in a dozen or more drawings in a single year in the Architectural Room of the Academy Exhibition. His artistic powers were versatile,—buildings, landscapes, figures, battle-scenes, and any other subjects were handled in a masterly way. All the sketches made by Mr. Simpson during the Crimean War were rendered by Walker as finished productions in chromo-lithography, and afterwards those of the Indian Mutiny, published by Messrs. Day & Son. In the misfortunes of that firm he largely participated, a blow from which he never fully recovered. His gentlemanly bearing, and refined feeling, and honourable dealings, added to his ready apprehension of what was wanted, and his punctuality in keeping engagements, attached many architects to him very closely, and the profession has sustained a loss.

H. J. PAULL.

OBITUARY.

Mr. James Inman.—Died, on Friday, the 25th ult., in his 72nd year, Mr. James Inman, long in the employ of Messrs. Crace, of Wigmore-street, and for the greater part of the term their trusted and respected foreman. Mr. Inman was Messrs. Crace's foreman of painters, and had remained continuously in their employ for fifty years and some few weeks at the time of his death, which occurred suddenly on his return home from his day's work. It was latterly his boast that he had never, during the whole of that time, been five minutes late in coming to work in the morning; and this was literally true at the time of his death, for he was at his post at six o'clock on the morning of his death, though contrary to the advice of his employers, he having shown signs of ailing the previous day. It is, perhaps, needless to say that he was a most careful and temperate man, and had made his employers' interests his own chief interest. They lose a valued and trusty old friend.

Sale of Land at Clacton-on-Sea.—On Monday last, by direction of the Clacton-on-Sea and General Land, Building, and Investment Company, Limited, Messrs. Harman & Matthews, auctioneers, held their second sale this season of freehold building land at Clacton-on-Sea. A large number of small plots, realising in the aggregate about 4,500*l.*, were sold, and a large plot, having a frontage of 400 ft. to Harold-road, was sold for 600*l.*

THE EXPLORATIONS OF ROMAN VILLA AT BRADING.

LADY OGLANDER (having acquired that portion which belonged to Mrs. Munns) has granted a lease of the whole site of the Roman villa at Morton to Messrs. John E. Price and F. G. Hilton Price, to enable them to continue the explorations.

As these gentlemen, who formerly acted as executive for the committee that was formed, have now full legal right to carry on the work themselves, the functions of the committee, it is thought, may cease.

It is proposed, therefore, to hold a final meeting of the committee on this Thursday, the 31st of August, at one o'clock, on the site of the Villa, to report the work done and to dissolve. The arrangement certainly does not commend itself to us. It may be all right, but the statement reads oddly.

THE "NOVELTY" THEATRE.

THIS theatre, as we stated in our last, is approaching completion, and will probably be opened some time in October. The theatre occupies a site on the north side of Great Queen-street, Lincoln's Inn-fields, and has a long frontage to Parker-street. The architect is Mr. Thomas Verity, whose plans have been well carried out by Messrs. Kirk & Randall, the well-known contractors, whose representative on the works is Mr. E. Smith, Mr. H. M. Taylor being the clerk of works. The theatre will accommodate in all from 1,400 to 1,500 persons, thus distributed:—In the pit, 500; in the stalls, 90; dress-circle tier and private boxes on same tier, 150; upper-circle tier and private boxes, 150; gallery, 600. The principal portions of the theatre are approached by a handsome and roomy vestibule, entered from Great Queen-street. The theatre itself is placed at right angles to this vestibule, or, in other words, parallel with Great Queen-street, the stage being at the west end. The private boxes will be provided with movable partitions, so as to allow of two or three compartments being thrown into one when necessary. The whole of the construction of the box and gallery tiers is of iron and concrete, by Messrs. Dennett & Ingle, who have also supplied the iron girder carrying the wall above the proscenium opening, and the girders which carry the flank walls over the private boxes. Behind these flank walls, and over the second tier of boxes, are located dressing-rooms and other apartments connected with the stage department of the theatre; these, however, are quite isolated by fireproof construction from the auditorium. By means of a mezzanine, two stories of dressing-rooms are obtained in the height of the gallery tier at each side of the theatre, the gallery only occupying the central portion of the tier, and not extending over the private boxes. Besides the dressing-rooms already named, there is, at the back of the stage on the side next Parker-street, a tier of six other dressing-rooms. The depth of the stage from back to front is about 27 ft. The width of proscenium opening is 26 ft. 6 in. The whole of the decorations will be in fibrous plaster by Messrs. George Jackson & Sons, of Rathbone-place. The sanitary fittings throughout will be supplied and fitted by Messrs. John Bolding & Sons. The sun-burners in theatre and *foyer* are by Messrs. Strode & Co.; the revolving steel shutters at the entrance to vestibule are by Messrs. Archibald Smith & Stevens, of Leicester-square; and the effective ornamental ironwork in handrail to principal staircase and elsewhere is by Messrs. W. T. Allen & Co. The excavations for the building have been carried down 22 ft. into the blue clay, and this has involved the underpinning of the somewhat dilapidated properties by which the theatre is almost completely hemmed in except on the Parker-street side. The vestibule, which forms the principal entrance from Great Queen-street, is 56 ft. long by 26 ft. wide. This vestibule is on a level with, and affords direct access to, the dress-circle tier, the private boxes being reached by descending a few steps. An extra exit for this tier is provided, opening into Parker-street. The upper circle is reached from the vestibule either by means of the grand staircase leading up to the *foyer*, or by the upper-circle staircase on the opposite side of the vestibule,—the latter staircase being continued up to the gallery with the view of serving as a supplementary exit from that portion of the house, should it ever be necessary. There is also an extra exit from the upper-circle tier into Parker-street. The entrance to the pit is from Great Queen-street, by a passage on the east side of the vestibule, leading to a flight of steps going down to the pit. There is another exit from the pit into Parker-street. The gallery entrance is from Parker-street. For every part of the house there is thus provided means of exit in addition to those afforded by the entrances. There are no tortuous passages, no winding stairs, and all the staircases are of stone. On each tier there will be provided a refreshment saloon and separate retiring-rooms for ladies and gentlemen. The *foyer* is a handsome room over the vestibule on the upper-circle level, and looking into Great Queen-street. It will measure 33 ft. by 26 ft., and be 20 ft. high to the ceiling. This will, it is stated, be made into a very attractive picture-gallery. The amount of Messrs. Kirk & Randall's contract is between 10,000*l.* and and 11,000*l.*, but the total cost will be not far short of 15,000*l.*

EXTENSIVE ROMAN REMAINS AT BATH.

WE have already incidentally alluded to the excavations which have been for some time in progress on the site of the Roman baths, and we are indebted to *Keene's Bath Journal* for some details concerning a bath which is now being excavated. The *Journal* says,—

In the centre of a large rectangular area is sunk a bath, nearly 80 ft. long and 38 ft. wide, its sides formed by six continuous steps. The bath is 4 ft. 9 in. deep. On the north and south sides,—the lengthway of the bath,—are massive pedestals with moulded base, and upon them were built the piers and columns that supported the roof. These pedestals are about 13 ft. apart, and are of a particularly massive character. Midway on the north side is a small reclining figure, which, much to the regret of antiquaries, has been damaged very considerably. In the centre of the figure is an aperture, which probably served as a channel for a pipe which conveyed the water to supply the bath. The steps leading from the figure are "notched," and a small pier of masonry juts out into the bath, and this, it is believed, formed a base upon which, in all probability, rested a trough or basin to receive the water flowing from the pipe, and thence was allowed to overflow into the bath. The whole of the bottom of the bath is covered with lead, which remains as originally laid on a bed of concrete, and the thorough and complete manner in which the bath was erected may be inferred from the fact that a layer of freestone, about 1 ft. thick, served as a foundation to the whole. At the four corners of the bath are apses (semicircular recesses), and midway on the north and south sides are square recesses; each angle is finished with a pedestal having a moulded base. A portion of the bath was covered in with a light but strong roof of hollow bricks of Roman manufacture. A large number of these bricks have been found among the *débris*, but some doubt has been expressed as to whether they were used for the purpose of a roof. These hollow bricks, it has hitherto been supposed, were used only in connexion with the conveying of heat from the hypocaust fires, but in the course of the excavations masses of these tiles were met with, which, on careful investigation, and examination, suggested to Mr. Mann (in whose hands the work had been placed) the idea that they were portions of an arched roof.

The stone used throughout is the freestone so plentifully found in the quarries around Bath. The lead in all probability came from the Mendip hills. . . . .

Amongst other interesting objects discovered during the excavations is a rude representation of Minerva, which was found nearly at the bottom of the bath. The face and helmet are damaged and the spear-head broken. The owl resting on the shield is also somewhat damaged, but still recognisable, and the head of Medusa as a breast-plate stands out very clear. In connexion with this it may be mentioned that in 1790, under the foundations of the present Pump-room remains of a temple to Minerva were found.

The Antiquities Committee, who have proceeded with the work of uncovering these remains, are to be congratulated upon the

success which has so far crowned their labours. Much, no doubt, remains to be done, and money is needed to enable them to complete the work. We cannot, however, conceive that the learned world will withhold its aid.

Mr. Jerom Murch is the chairman of the Antiquities Committee, and (under the supervision of Mr. Davis, the surveyor of works to the Corporation) the work is being carried out in a satisfactory manner by Mr. R. Mann, the contractor.

COMPETITIONS.

Sculptural Panels for St. George's Hall, Liverpool.—The committee appointed to consider the designs received in the above competition have decided to recommend the Council to award the premiums as follows:—No. 1, 200*l.*, Mr. Thomas Sterling Lee, Merton Villa Studio, 280A, King's-road, Chelsea, London; No. 2, 100*l.*, Mr. J. Milo Griffith, 243, Stanhope-street, Regent's Park, London; No. 3, 50*l.*, Mr. W. S. Frith, 336, Clapham-road, London. The designs which have received the first premium represent Wisdom, Justice, Temperance, Orpheus, Tragedy, Comedy, and Astronomy. The author of these designs remarks that the parts of the building designed for the introduction of the sculpture naturally resolve themselves into four grand divisions or series, and may be grouped thus:—First series: The six panels on the left of the entrance to be devoted to the attributes and results of Justice. Second series: The six panels on the right of the entrance to be devoted to the causes and results of National Prosperity. Third series: The eleven panels at the north or Concert-room end, nine panels of which are on the circular portion, to be devoted to subjects symbolised by the Nine Muses, and the two on the return flanks to be devoted to Orpheus, as symbolical of Singing, and to Tubal Cain, as symbolical of harmony. Fourth series: The remaining five panels at the corners of the building to be devoted to subjects emblematic of the Arts.

The Ebbw Vale Market Company (Limited), having offered the sum of 20*l.* for the best design for a new market-house, to be built near the London and North-Western Station, Ebbw Vale, plans from various architects were submitted, and those prepared by Mr. E. A. Lansdowne, of Newport, Mon., finally accepted. The stalls for poultry, butter, basket-fruit, vegetables, clothes, and boots and shoes, will be made to travel on rails to the end of the hall, where they will form supports of the large platform when the building is used for public entertainments, concerts, &c. The butchers' stalls will be open. The main walls will be of blue pennant stone, with Bath stone dressings, and the roofs formed of angle and bar iron. The total cost, when finished, will be about 2,000*l.*

GLASGOW MUNICIPAL OFFICES COMPETITION.

SIR,—In making a cube estimate of my design, to which the first premium was awarded in the first competition, I valued the whole at 1s. a cubic foot, taking the height in the usual way, from the bottom of the foundations up to half the height of the roof, the result being 150,432*l.* The towers were included in that valuation at the same rate.

Mr. Barry, in his report, said that he considered the estimate insufficient, and that it would require 220,000*l.*, without reckoning the sculpture.

The author of the design now adopted, estimated the basement story up to the ground-floor line at 9d. a cubic foot; thence, to half the height of the roof at 1s.; and the towers above that level at 1s. 6d.

Mr. Barry considers this estimate sufficient.

I have not seen Mr. Young's design, but from the published descriptions it does not appear to be any less elaborate than mine.

If that is the case, Mr. Barry has evidently modified his views of the cost of building in Glasgow to a very considerable extent.

G. CORSON.

TAR ROOFS.

THE German Government has on several occasions pointed out to farmers and others interested in agriculture, that too great an expenditure of capital on buildings is a mistake. With a view of illustrating the application of this principle of economy to roofing, the *Cologne Gazette* points out that the system of using tar for roofing purposes is at the same time economical and suitable for agricultural buildings, and what is said may serve as an answer to a recent inquiry in our own pages. The framework of the roof can be of relatively slight construction on account of the nature of the covering it is intended to support, and the perpendicular height of the roof can be one-eighth to one-tenth of the entire depth of the building. The distance of the rafters is arranged according to the width of the covering material, the scale being that from the middle of one rafter to the middle of another. The distance should be 2⅜ in. less than the width of tar roofing sheets.

Immediately above the rafters come boards, and upon these (exactly in the centre of the separate rafters) are placed strong laths, about 2 in. wide and 1⅛ in. thick, the upper edges being taken off. The roofing sheets are now placed so as to cover the spaces between the laths, and are nailed. Over the laths are placed strips of paper, 5 in. to 6 in. wide, fastened with nails at intervals of 2⅜ in.

In order to make the sheets lie smoothly upon the boarding, it is suggested, in case they are too dry, to soften them by immersion in water. It is recommended that the workmen should not wear heavy-nailed boots, and also that if the rain comes on, the roof should not be walked upon immediately after. When the entire surface of the roof is covered with sheets, the strips of paper (or caps) already named, as well as the joints, are painted over with a hot mixture of coal tar and pulverised lime. Pure dry sand is at once sprinkled over this coating, and particular care must be taken that all the nail-heads are well covered. When the paint is dry the whole surface of the roof is once more coated with the same mixture, and is sanded.

The object of this careful method of overlaying the roof with several coatings of specially prepared solutions is to preserve in the tar those oleaginous and fatty properties which it soon loses if exposed to the air, and the retention of which is an indispensable condition of its resistance to water. Clay and sand do not afford sufficient protection, as they are removed by violent winds.

Reference is made to various systems of coating the tar roof with protective substances, for the purpose indicated. One of the most successful methods consists of a mixture of cow-dung and thin white-lime, which is spread over the entire surface of the roof. If such a coating is not applied, the tar paint must during the first four years, be annually renewed, which enhances the cost of the roof. If the last-named protective composition is used, and renewed every two years, the coating of tar and lime can be dispensed with. Particular mention is, however, made of a coating of tar, mixed with Portland cement, the tar being well heated and used in the proportion of 111 lb. to 200 lb. of cement. The mixture should be kept well stirred during preparation, and should be applied as soon as made. This particular method has been tried in many cases in Germany, and according to the journal quoted from, its satisfactory results have caused its adoption upon a scale of progressive importance.

ST. JAMES'S RESIDENTIAL CHAMBERS.

A VERY extensive block of buildings, called St. James's Residential Chambers, covering an area of upwards of 13,000 superficial feet, is at present in course of erection at the West End. The premises are situated between King-street and Jermyn-street, and have a frontage to Duke-street 110 ft. in length, and one to Ryder-street 119 ft. long. They are faced with Prudham stone, from the quarries near Newcastle-on-Tyne. The two elevations, which are strictly uniform in their architectural character, have three lofty stories above the ground-floor, the third story being surmounted by a bold and richly-carved cornice. The height of the elevation to the top of this cornice is 50 ft. Above rises a high-pitched roof, in which there are two additional floors, the upper floor having pediment dormers. The entire height of the building to the ridge of the roof is 75 ft. The ground-floor of both frontages will consist of shops, each shop having handsome elliptical-headed windows, with rusticated and fluted pilasters between each shop. At the west end of the Ryder-street frontage there is an arched entrance, 10 ft. in width, to the Turkish Baths in Jermyn-street, the proprietor having a private right of way from Ryder-street to the baths. Above the shops there is an ornamental cornice. The first and second floors have each a range of eight arched and pediment bay-windows, the columns at each angle of the bays being ornamentally carved and panelled. The third-floor windows are three-light. The entrances to the chambers will be in both streets, leading to spacious and decorated staircases.

The interior of the buildings is well arranged for their intended purpose. The first and second floors will consist of suites of two rooms each, viz., a living and a bed room, each suite having separate bath-room and other conveniences. There will be ten of these suites on each floor. The rooms are all of uniform size,—20 ft. 6 in. square. The third floor will consist of twenty single rooms, each room having a separate bath, as in the suites on the first and second floor. The fourth floor in the roof will be similarly arranged as the third floor. The attic floor will be reserved for the servants. The kitchen and culinary department will be in the basement, from which there will be a lift to the top of the building. The whole of the floors, with the exception of the attic, are fireproof.

Messrs. Jameson & Wallis, of Great Russell-street, Bloomsbury, are the architects, and Messrs. W. & C. Macgregor, of London and Edinburgh, the contractors. Mr. Lawson is clerk of the works.

GREAT TEY CHURCH, ESSEX.

ONE of the most interesting specimens of church architecture visited during the late excursion of the Essex Archæological Society was the Church of Great Tey, dedicated to St. Barnabas. Mr. G. Golding draws attention to its miserable condition.

The fine Norman work of the eleventh century consists chiefly of the square central tower (all now left), itself well worthy of a visit. It is of pure Norman architecture, having been a cruciform structure, with nave, aisles, two transepts, and chancel; but the state of the interior of the sacred edifice presents a series of Vandalisms happily now seldom met with. The pews are placed facing west in the chancel, which is at the east end, the nave having been suffered to fall into total decay and ruin, and is totally gone. This of a church stated in the Clergy List to be, with vicarage and sinecure attached, of the now value of above 1,050*l.* yearly.

THE CHURCH IN SCOTLAND.

SIR,—In your issue of July 1st I observe that you enter among the items of "Dissenting Church Building News" a notice of the new Episcopalian church at Keith, Scotland. Now, as a Scottish "Episcopalian" Churchman I protest against our churches being described as "Dissenting." The term is as wrong in fact as it is in principle. The Episcopal Church of Scotland is not in any sense a dissenting church. Politically and historically it is the oldest religious body in Scotland, and was disestablished in 1698 in favour of Presbyterianism. Therefore whatever it dissents from, it cannot be said to dissent from the Establishment. To term Churchmen Dissenters in Scotland would but raise a smile on the face of every Presbyterian who heard it. The term "dissenter" is, however, a purely English one, and is practically unknown in Scotland. In your columns it is clearly used as meaning a Christian community outside the Church of England. Hence the Episcopal Church of Scotland being in full communion with the Anglican Church is manifestly not a dissenter from it. It has already been shown as being no dissenter from the Scottish Presbyterian Church. Therefore in no sense is it a dissenting church.

I would, however, suggest that your division of news of ecclesiastical building into "Church" and "Dissenting Church" is, for a secular journal, an infelicitous one. Rather I would prefer to see all Christian denominations classed in one column, such as Church of England, Church of Ireland, Episcopal Church of Scotland, Established Church of Scotland, Wesleyans, Independents, Roman Catholics, &c.

India, July 30. SCOTO-CATHOLIC.

BUILDING PATENT RECORD.*

APPLICATIONS FOR LETTERS PATENT.

3,956. J. H. Johnson, London. Production of artificial stone or marble. (Com. by the Certaldo Marble Company, Paris.) Aug. 18, 1882.

3,965. S. Cornforth, Birmingham. Apparatus for punching nail holes in roofing slates. Aug. 18, 1882.

3,969. J. Chaffin, Charlcombe. Glazing greenhouses, &c. Aug. 19, 1882.

3,990. E. Tomlinson, London. Apparatus to facilitate the lighting of fires, &c. Aug. 19, 1882.

4,000. A. Keim, Munich. Process for rendering wall-paintings weatherproof. Aug. 21, 1882.

4,002. R. W. Crabtree, Leeds. Kitchen ranges. Aug. 21, 1882.

4,031. W. R. Lake, London. Heating apparatus. (Com. by M. J. Walsh, New York, U.S.A.) Aug. 22, 1882.

NOTICES TO PROCEED

have been given by the following applicants on the dates named :—

August 22, 1882.

1,828. A. Smith, Huddersfield. Securing and holding sliding window-sashes in a closed or open position. April 17, 1882.

2,017. H. J. Haddan, London. Manufacture of mosaics. (Com. by G. Stanley, Massachusetts, U.S.A.) April 28, 1882.

3,944. G. J. Dickenson, Albany, U.S.A. Sash-fasteners, Aug. 17, 1882.

August 25, 1882.

1,916. T. A. Riggs, Aldeburg. Combination of substances for bricks, blocks, &c. April 22, 1882.

1,959. J. Noad, East Ham, and H. Salomon, London. Manufacture of ornamental surfaces for building, &c. April 25, 1882.

1,974. J. Henson, Derby. Barns and shelters with rising and falling roofs. April 26, 1882.

1,979. J. Beresford, Birmingham. Urinals. April 26, 1882.

ABRIDGMENTS OF SPECIFICATIONS.

Published during the Week ending August 26, 1882.

237. M. Delmard, Plumstead. Window-sash fastener. Jan. 17, 1882. Price 2d.

An eccentric cam is moun ted on the lower sash, which, on being turned, engages a hooked stud on the upper sash. (*Pro. Pro.*)

258. R. G. Greig, London. Stoves for heating and ventilating. (Com. by the Detroit Stove Works Company, Detroit, U.S.A.) Jan. 18, 1882. Price 1s.

The improvements are in a number of details which are not capable of being summarised. The principal one is that a separate shell surrounds the magazine section through which air circulates and is warmed.

261. E. L. Voice, London. Decoration of wall surfaces and ceilings. Jan. 19, 1882. Price 2d.

The decoration is effected by laying on the finishing coat of plaster with a composition of cement mixed with colouring matter and a small proportion of sand. The ornaments are then cut out of the plaster, and filled in with suitable colour. After drying the surface may then be painted. (*Pro. Pro.*)

265. J. Westley, Chorley. Rollers and fittings for blinds. Jan. 19, 1882. Price 2d.

A groove is formed in the roller, and a strip made to fit the groove. When the end of the blind is placed in the groove the strip is forced in and secures the blind. (*Pro. Pro.*)

276. T. Rowan, London. Ventilating water-closets, urinals, drains, &c. Jan. 19, 1882. Price 6d.

This is an improvement on Patents Nos. 5,303 of 1880, 162 of 1881, and 505 of 1881, in employing jets of water for producing an induced current for carrying off the foul air and gases.

295. S. H. Terry, London. Water-closets and urinals. Jan. 20, 1882. Price 6d.

Instead of using a hand-lever for actuating the valves, &c., a pedal lever is employed.

306. G. Smith, Bradford. Application of earthenware pipes for conveyance of gas, water, sewage, &c. Jan. 21, 1882. Price 2d.

These are embedded in cement or concrete to enable them to withstand the pressure and prevent leakage. (*Pro. Pro.*)

317. J. Holroyd, Leeds. Sanitary trough closets. Jan. 21, 1882. Price 6d.

This is an improvement on Patent No. 2,915 of 1879, in making the outlet above the bottom of the trough to ensure a continuous supply of water therein. The bottom inclines upwards to lead the material to the outlet. The trough is flushed from the other end.

351. J. Holroyd, Leeds. Tanks for flushing and ventilating drains. Jan. 24, 1882. Price 6d.

These are constructed of earthenware pipes, at the bottom of which is the outlet-valve, which is opened periodically. A man-hole on the surface of the ground, covered with a grating, is provided for ventilation, &c.

* Compiled by Hart & Co., Patent Agents, 28, New Bridge-street.

CONVICTION FOR BUILDING ON AN ADVANCED LINE OF FRONTAGE.

AT the Edmonton Petty Sessions on Monday week, and by adjournment on Monday last, was heard, before Mr. M. Latham and other Justices, a summons, issued at the instance of the Tottenham Local Board of Health, against Herbert Oxenham, of Berwyn House, Finsbury-road, Wood Green, "For that he unlawfully, and without the consent in writing of the Urban Authority of the Tottenham District, did bring forward a certain house forming part of a street there, called Bounds-green, and beyond the front wall of the house on one of the sides of such house, and did continue such offence for three days after receiving a written notice in that behalf from the said Urban Authority to remove the same."

Mr. Crowne, clerk to the Tottenham Local Board, said the defendant was summoned for a violation of the 156th section of the Public Health Act, and that he was liable to a penalty of 40s. a day after a written notice had been given to him that he was committing the offence. The Local Board had not given him the consent to bring out his buildings, and in the month of April last he had a distinct notice that he could not erect his buildings until the line of frontage had been decided upon by the Board.

Mr. De Pape, surveyor to the Local Board, said he had inspected the site on which the defendant was erecting some houses, and those houses next to it, which he knew were erected over six years ago. The frontage of those built by the defendant was 10 ft. 3 in. beyond that of the others. No application had been made for permission to bring out the fronts, nor would the witness have advised the Board to consent to such an application.

Mr. Woodgate, barrister, who appeared for the defendant, subjected the witness to a long examination on technical points, the principal being the meaning of the term, "line of frontage."

Mr. Wilson, inspector of buildings to the Local Board, proved having served the summons on the defendant on the 5th ult. He saw the defendant, and expressed his dissatisfaction with the footings and brickwork of the buildings, and the defendant removed them. It was not his duty to define the line of frontage, and he had no conversation with the defendant on that subject.

The Bench determined, before giving their decision, to view the site and buildings, which they accordingly did.

Mr. Latham, on the matter coming before the Bench again, said they had given a great deal of attention to the case, and had been to view the place, and in the opinion of a majority of the justices, there must be a penalty of 40s. for the original offence, but not a continuing penalty. It was a decision in which he himself did not concur, but a majority of the Court were of the opinion he had stated. He believed the technicality of the Act was not met by the facts of the case.

The defendant said he discontinued the building on receiving the notice.

Mr. Latham said that was the reason they did not inflict a continuing penalty.

An appeal was then asked on the part of the defendant, and at once granted by the Bench.

WIND PRESSURE.

IN the Mechanical Science Section of the British Association meeting at Southampton, the first business on Tuesday last was the reception of the report of the Committee on Wind Pressure :—

Stated that the total pressure on small plane surfaces due to actual winds in high and exposed positions had to a great extent been ascertained with sufficient accuracy for engineering purposes. It must be assumed, for the present at least, that, for engineering purposes, pressures of 80 lb. or even 90 lb. per square foot on surfaces had been correctly recorded in extremely exposed positions, such as the Bidstone Observatory ; while pressures approaching the limit prescribed by the Board of Trade, 56 lb. per square foot, might possibly act on engineering structures in exposed positions. As in the design of marine works, the depth of water and the length of fetch enabled some estimate to be made of the strength of structure required to withstand the heaviest seas to which they might be exposed, so a careful comparison of the wind pressure observed during the height of a gale at various stations where anemometers existed would enable some estimate of the relative exposure of similar places to be made. Exceptionally high gusts of short duration should be excluded from the comparison as being probably limited in area.

In the course of the discussion which followed, Mr. Barlow expressed the opinion that any work made strong enough to withstand the regulation pressure of the Board of Trade would not be in danger from any wind which would ever blow in this country.

The Committee was re-appointed.

RAILWAY CLOCKS.

SIR,—Having read Mr. Morgan's letter in last week's *Builder* about the regulating of railway clocks, I would ask you to allow me a small space in your paper for a few words on the subject. My excuse for taking the liberty is that I have had many years' experience both in making railway watches and clocks, and in attending to the clocks on the lines.

I quite agree with Mr. Morgan's remarks that railway clocks ought to show, as near as possible, the correct time, and that the present state of railway clocks, and, I may say, of most of our public clocks, is far from satisfactory ; but there are difficulties which non-watchmakers are not likely to see. All railway stations shake very much when a train passes or comes to a sudden standstill, and the pendulum is thereby disturbed each time. The pallets of station clocks wear in a remarkable way, and differently from other clocks, showing distinctly the trembling of the pendulum when the trains pass. The temperature, also, is very variable, and many of the stations,—in fact most of them,—are very damp. Some of the above-mentioned difficulties could be overcome to a great extent, but at present they are disregarded altogether. Clocks are fixed in places where it is impossible for any clock to go correctly. Railway clocks may be seen in all conceivable places, some sticking out from the wall like a lamp, others suspended like a trapeze ; some are made to carry several sets of hands, and constructed so that it is utterly impossible for the different hands to show the same time. As far as my experience goes, it is a question of expense ; the price paid at present for railway clocks and for keeping them in order is much too low to obtain correct timekeeping.

CHRISTIAN LANGE.

OLD BUILDINGS, YARMOUTH.

SIR,—At a recent special meeting of the Great Yarmouth Lands Committee it was carried "That the old Tolhouse hall and the entire contiguous property be sold, the fixtures, materials, and ground in separate lots ; the total amount thus realised to be applied to the funds for defraying the costs of the erection of the new municipal buildings."

Unless some steps are taken at once, or a strong protest raised, the above quaint and interesting old building must rapidly disappear, as in about three weeks or a month the sale will take place.

Your readers may possibly remember the building in Middlegate-street, with its external staircase inclosed with a wooden balustrade, its canopied and blue-coloured figure of justice holding the sword and scales, and surrounded by the arms of the town ; and its high-pitched roof, with gable windows. Herein was the Hall of Justice,—since the time of King John,—and it has been the scene of many trials of pirates and prisoners.

Underneath "the great chamber at the Tolhouse hall," as Manship writes (and it is but a small place after all), are many dungeons and the gaoler's house, in which felons and debtors were, until lately, confined. At the top of the staircase from the street, and also in the prætorium (as it is described), are two beautiful Early English doors, the latter having a double row of dog-tooth mouldings, and being in a perfect state of preservation, and which probably formed a portion of the monastery of Grey Friars, who settled on adjacent property in 1270.

The building is now untenanted, owing to the courts being removed to the new town-hall, but it is to be hoped that such an historical building may not fall into the hands of the despoiler, but may eventually be retained as a museum for the display of much that it is the pride and good fortune of Yarmouth to possess.

E. PRESTON WILLINS.

KING'S CROSS TO FARRINGDON-STREET.

WORKMEN'S TRAINS.

SIR,—In the body of an average working man, what proportion does the width across the shoulders bear to the thickness from front to back? After many experiments, I find it to be as 8 is to 5. The experiments were conducted in this way. Having, some little time back, to carry out a job in the City, I left my lodgings near Russell-square to catch an early workmen's train at King's-cross Station of the Underground Railway. There are five of these trains between 5·50 and 6·50 a.m. and the first two are almost invariably found to have every seat occupied on arrival at King's-cross, where very few get out, and from 100 to 200 are waiting to get in to be conveyed Citywards. The compartments accommodate five persons on each seat, and as it is essential that the workmen should be at their work, and not standing catching cold on the platform, they crowd into the standing-room between the knees of the sitters, to the extent I have indicated,—five on each seat, and eight standing edgeways between them.

Of course these experiments,—which, doubtless, are being continued,—are very unpleasant for those engaged in them, and are, I believe, contrary to law; and I have sometimes wondered whether the Board of Trade or other proper authority would interfere if it should come to their knowledge.

In the labour list you published on the 12th ult., the rate of wages of plumbers in Birmingham is given as 7d. per hour; it should be 8½d. per hour in town, and 9d. per hour on country jobs, with lodging and travelling money.*

E. GRIMES.

WATERPROOF CEMENT, &c.

SIR,—Before touching the above subject, I wish to ask if it is known where or how a good yellow can be procured that will stand the chemical action of Portland cement when it is incorporated in the body of that material? Also, a black and a yellow to withstand the caustic properties of silicate of soda and potash, separately or combined with the various compounds, cements, and limes? If any of your readers can supply the required information, it would be of good service. In surface decoration it is simple, which is no test proof for the above.

I have long and often used copperas mixed and gauged with Portland cement, oxide of zinc, and magnesite, likewise in other compounds, cements, and limes, and I have found it equal in every particular to their more natural chlorides, and in some respects far superior both with and without the silicates; and when well beaten up or ground when gauged I have never experienced in it a tendency to crack, even though the cement may be too fresh (which is overcome at all times with a small percentage of lime putty). The lias lime, of course, is the best; and by reversing this we add a small percentage of Portland cement to any of the lime, say, from 1 to 10 per cent., either of which will greatly improve the limes: the most suitable for bricklaying or pointing, and for plastering,—more so where exposed to the damp of the weather.

To obtain a yellow, I have in the same manner used picric acid with and without ochre, and this I have immersed in strong solutions of copperas; also a solution of picric acid, and the two combined, but the nearest approach to a yellow gained even then has been a dull fawn colour.

Ultramarine blue will stand, and with or without it, by choosing a blue Portland cement, submitted to a bath of the copperas and picric acid, a deep bronze-like green of a metallic cast is produced; a corresponding effect, but of a more varied kind, is obtained with other colours, and where a variety of coloured parts are brought in juxtaposition it has a very remarkable and beautiful effect, some of the lighter colours becoming much changed. These processes, employed with that I have shown and explained to you at various times, if properly developed, would most certainly and fully realise the long-sought quest of the Social Science Congress and other science assemblies, for the artistic, architectural, and horticultural improvements of our streets, town and country houses, from the mansion to the cottage.

EDWIN ROBBINS.

P.S.—Further to improve the colour, and render it still more durable and waterproof, I saturate or coat the same with paraffin and petroleum, as represented by Herr C. Puscher, but in addition I use tallow, and with paraffin and soap dissolved in hydro-carbon, &c., which gives a splendid polish. Yet to further firm, heighten, and protect the same, I coat it with silicate of soda, which I first rub with a cloth slightly damped with a chloride, after which no water will penetrate or stain. This will give a most perfect face to plaster or Keene's cement, as proved in the Marezzo marble by me at various works, the receipt for which I sold for 2*l.* in 1876.

* We gave our authority.

PROVINCIAL NEWS.

Bideford.—The new bridge buildings recently erected at the western extremity of Bideford Longbridge, overlooking the river, and also facing the Guildhall, are about to be formally opened. The records of the old buildings formerly occupying the site, and which comprised the Bridge Hall, Grammar School, and Free School, are of some interest. The new buildings have been erected at a cost of about 4,000*l.*, the architect being Mr. Brydon, and the contractor Mr. R. T. Hookway, Bideford. On three sides the structure abuts on main thoroughfares, viz., the Quay, Bridge-street, and Allhalland-street. The main front and entrance are in Bridge-street, facing the Town-hall. Along the Quay the buildings extend 60 ft. in length by 50 ft. in height. The Bridge-street façade has similar dimensions, while in Allhalland-street the measurements are,—length, 50 ft.; height, 40 ft. Facing the river are three stories, the first affording accommodation for the Public Free Library and Reading-room, the second throughout its whole length comprising the new Bridge Chamber, while the upper story on this side, together with one or two additional rooms, is intended for the use of science and art classes. The stone used for the walls is from a local quarry, while the window-jambs, mullions, and ornamental portions are of Ham-hill stone. Quite a feature in the exterior of the edifice is the carved work by Mr. Harry Hems, of Exeter.

Liverpool.—Mr. G. F. Lyster, engineer to the Mersey Docks and Harbour Board, in his annual report, says of the Mersey Tunnel works:—On the Liverpool side a second shaft has been sunk in connexion with the Mersey Tunnel, and the drainage heading driven for a length of 385 ft. The tunnel is driven for a length of 490 ft., of which 365 ft. is lined with brickwork. At Woodside the drainage heading is driven for a length of 1,070 ft., of which 645 ft. is lined with brickwork, and the tunnel has been driven for a length of 760 ft., of which 400 ft. is lined with brickwork.

Lincoln.—A new "Coffee Palace" on the High Bridge, Lincoln, has been opened, in premises formerly occupied by Messrs. Fox & Son, ironmongers. The alterations have been carried out by Messrs. Martin & Sims, from plans prepared by Messrs. Watkins & Scorer; and the fittings, &c., were supplied by various local tradesmen.

VARIORUM.

A NEW and enlarged edition of "Elements of Acoustics, Light, and Heat," is published by Messrs. William Collins, Sons, & Co., and as this is the fortieth thousand, nothing need be said of it. A selection of questions from some of the former Government papers, with their solutions, is given, and will be found useful.——We have before us a new edition of another work on physics of much larger scope and more important character, namely, the "Elementary Treatise on Natural Philosophy," by A. Privat Deschanel, translated, with modifications, by J. D. Everett, F.R.S. (Blackie & Son, Old Bailey). The fact that a book of this size and character has passed through six editions gives satisfactory indication of the increased study of science.——It is proposed to publish by subscription (Infield, Fleet-street), in a handsome crown 4to. volume, "Bramshill: its History and Architecture," by Sir William H. Cope, bart. The history will be traced from the eleventh century down to recent times, with notices of its successive owners and occupants, the architecture, external and internal, of the present mansion.——Sir J. H. Ramsay has continued his investigations on the national finances in the fourteenth and fifteenth centuries, and an article on the accounts of Henry IV. (in continuation of a former one on the accounts of Richard II.) appears in the September number of the *Antiquary*.——The publication of a curious collection of the London signs of booksellers, publishers, and printers up to the end of the seventeenth century is commenced in the September number of the *Bibliographer*.——Under new auspices the *Pictorial World* will, on the 2nd of September, appear in a permanently enlarged form, and with every material promise of greatly extended popularity. There is to be a coloured supplement every week, the first series being portraits of the generals commanding the forces in Egypt. The name of Messrs. Dalziel wil guarantee the excellence of the engravings on wood.

Miscellanea.

The Water Supply of Leeds.—Mr. Meysey Thompson, in his paper on the history of engineering in Leeds, recently read before the Institution of Mechanical Engineers, said, on the subject of the town's water supply,—In connexion with the engineering of Leeds, it will be interesting to mention the works, now nearly completed, for supplying Leeds with water. The operations at present in progress consist of the construction of a reservoir at Eccup, about five miles from Leeds, which is intended to contain, when completed, 1,400 million gallons of water. This is about six months' storage at the present rate of consumption; and, as the water will enter in a regulated quantity at one end, and be drawn out at the same rate at the other end, it is anticipated that the purity will be much increased by slow deposition during so long a period. The water is, in the first place, obtained from the moors about twenty miles from Leeds, the area of watershed drained being 25,000 acres. This water is collected in three reservoirs at Lindley Wood, Swinsty, and Fewston, about thirteen miles from Leeds as the crow flies, their respective capacities being 750, 960, and 870 million gallons, with a total water acreage of 426 acres. From these reservoirs the water will gravitate to Eccup, through two 30 in. pipes, and from Eccup it will flow through a tunnel under Black Moor, and thence by a 40 in. pipe to the filter-beds at Weetwood, whence it will be distributed to the several parts of the town. The grand total capacity of the four reservoirs mentioned will be 3,980 million gallons. The present daily consumption of water averages 7½ million gallons, the population supplied being about 300,000 persons. It may be stated that the present charge for water collected, stored, transmitted, filtered, and delivered to the consumers in Leeds is 1½d. per ton.

A Relic of the South Devon Atmospheric Railway.—Another of the towers, built some thirty-five years ago, when it was intended to work the South Devon Railway on the atmospheric principle, has ceased to exist. A few months ago it was decided to remove the tower standing near the village of Exminster, and it was suggested that dynamite should be used for the purpose. The work was entrusted to Mr. Wilson, clerk of works on the Powderham Estate. A few days since all the preparations were completed, and it was determined to light the fuse as soon as the mid-day express had passed. The greatest care and caution were needed to be exercised, as close on the one side was the railway and on the other a large pond, and Mr. Wilson's anxiety was to prevent the falling *débris* interfering with either. Holes were made in the tower for six cartridges. At the appointed time the fuse was lighted; in about three minutes the explosion followed, and the building, which seemed at first to lift slightly, suddenly collapsed like a house built with cards. The work was carried out with complete success; only about a wheelbarrowful of the *débris* fell across the down line, and this was cleared away in about two minutes. The tower was over 70 ft. high, and in its construction between 60,000 and 70,000 bricks were used.

Exhibition of Domestic Appliances.—An exhibition of domestic appliances is now open at the Agricultural Hall, Islington. The show is consequent upon the success which attended the exhibition of March last year, and has been organised by Mr. Chas. Messent, who was also connected with the Furniture Exhibition held last May. The exhibition will continue open until Sept. 7.

The Welsh National Eisteddfod.—At the Cymrodorion meeting on the 23rd ult., a paper by Mr. Cave Thomas, "On making the Eisteddfod a greater Institution, and connecting with it Scholarships and Athletic and Military Sports, and having a Permanent Building for it," excited much discussion, the provision of a movable building being largely advocated.

Middlesbrough.—The Church of St. John, Middlesbrough, is about to have added to it a spire. The architects are Messrs. Alexander & Rowlatt, of Middlesbrough, and Mr. T. Dickinson, of Saltburn, is the contractor for the work.

Examinations of the Society of Arts, Manufactures, and Commerce. — Programme for 1883.—The attention of secretaries of institutions and others interested in the Society of Arts' examinations is especially drawn to the fact that important alterations have been made in the examination system. The following are the principal points in which changes have been made since the publication of last year's programme:—1. The examinations in subjects of "Commercial Knowledge" have been renewed. 2. The three subjects, "Clothing," "Cookery," "Housekeeping," &c., will be comprised in a single paper, under the head of "Domestic Economy." The examination in "Health" will be continued under the title of "Sanitary Knowledge." 3. A fee of 2s. 6d. will be required from each candidate in each subject, except Practical Music, for which special fees are required. 4. No prizes will be given in any subject. 5. Certificates in three classes will be given. 6. The restriction as to the age of the candidates has been removed. 7. An examination will be held in any subject of "Commercial Knowledge," in addition to those already in the programme, for which twenty-five candidates offer themselves, provided the Council approve of the subject. The subjects of examination for 1883 will be:—1. Arithmetic; 2. English, including composition and correspondence, and *précis* writing; 3. Book-keeping; 4. Commercial Geography and History; 5. Shorthand; 6. French; 7. German; 8. Italian; 9. Spanish; 10. Political Economy; 11. Domestic Economy; 12. Sanitary Knowledge; 13. Theory of Music; 14. Practical Music. In addition to the above subjects, the Society will provide for an examination in any other subject which may fairly be comprised in "Commercial Knowledge," and of which the Council approve, provided not less than twenty-five candidates are guaranteed for each subject. The examinations in all the subjects, except practical Music, will be held on the evenings of Monday, the 9th, Tuesday, the 10th, and Wednesday, the 11th of April. The complete programmes can be had upon application to the Secretary of the Society of Arts, John-street, Adelphi, W.C.

The Public Offices Site Bill.—The protest in the House of Lords against the Public Offices Site Bill (signed by Lords Redesdale, Fortescue, De L'Isle and Dudley, and Stratheden and Campbell) expresses dissent from that measure because the Parliament-street and Great George-street site has long been considered the proper one for the Admiralty and War Office, and a considerable amount of property on it has been purchased by Government and a large extent of public land left unprofitably vacant for many years on that account; and because, among other reasons, the Bill only gets possession of the Spring Gardens property unaccompanied by any plan of the manner in which the buildings to be erected on it are to be applied to the Admiralty and War Office respectively, or of their architecture and elevation, leaving it uncertain whether the site will afford sufficient accommodation for those two great offices, or how far the aspect of the Horse Guards and Parade may be deteriorated by the new buildings. Further, because if the Admiralty is transferred to a new site, the present Admiralty buildings will give the means of concentrating in an economical manner, in a most convenient situation, a number of small offices now scattered over the town at a great expense and inconvenience.

Houses in Barnet.—James Rogers, the secretary of the Maldon Loan Company, London-road, Maldon, Essex, has appeared at the Barnet Petty Sessions to answer a summons charging him with having allowed a house to be occupied without giving to the Local Board the requisite notice. Mr. Rumble, surveyor to the East Barnet Valley Local Board, stated that a row of houses belonging to the defendant's company were being built at East Barnet. The architect was informed that when the houses were finished notice would have to be given to the surveyor so that he could inspect the houses and certify whether they were fit or not for habitation. A few weeks ago witness went to the houses and found one of them finished, and persons living it. The defendant, in answer to the charge, said that the builder of the houses was instructed by him when the houses were finished to give the necessary notice, but this the builder had failed to do. The Bench ordered the defendant to pay 20s. including costs. The fine and costs were at once paid.

Excavations at Lewes Priory.—These excavations have been pushed on steadily during the last fortnight, and despite the huge accumulation of *débris*, amounting to as much as 12 ft. in depth in most places, which has had to be cut through, it is now possible to make out more or less accurately the disposition of the buildings whose sites have been excavated. The substructure of the dormitory which occupies most of this area is formed of a number of square chambers communicating with each other by wide single arches or double doorways. Most of these, however, have been filled in at some later period, but prior to the suppression, with chalk masonry, probably on account of some threatened collapse of the Roman work. The walls are in some places still covered with a most perfect coating of plaster,—a mode of treatment far more prevalent in olden times than is usually supposed. By kind permission of the London, Brighton, and South Coast Railway Company, excavations have been made in the sides of the cutting through which the railway passes. These were most successful, resulting in the finding of the north-east angle of the refectory and the adjacent angle of the cloister. Behind these was uncovered an ample circular staircase or vice, corresponding in position with the one still existing on the south. It is to be hoped the railway company will cause these to be preserved to view and not covered up again. The line of the east wall of the cloister has been carried across the railway, and the continuation of it which formed the great south transept wall discovered in the bank. Similarly the north wall of the refectory has been opened out near the underground conduit, commonly known as the "lantern" or prison" (!). It is now possible to ascertain the exact site of the cloister, and therefore of the nave of the great church of which a fragment of the west end was uncovered some years ago. Next week we hope to announce further discoveries in connexion with this last most interesting point.—*Sussex Advertiser.*

TENDERS

For works at Salthill, for Mr. G. Hughes:—

	Stables and cottage.	Steps and gates.
D. C. Jones & Co., Gloucester	£1,222 0 0	£50 0 0
Ashfold, Slough	1,082 0 0	51 0 0
J. Deverill, Slough	996 0 0	48 0 0
A. L. Oades & Sons, Egham	985 0 0	49 0 0
J. Willis, Windsor	970 0 0	54 0 0
T. C. Cordery, Salthill, Slough	910 0 0	52 0 0
W. P. Reavell, Windsor	897 0 0	40 0 0
Martin, Maidenhead	893 0 0	42 10 0
R. Squelch, Egham*	879 0 0	50 0 0

* Accepted.

For making roads and drains to three acres of land in the city of Gloucester. Mr. E. J. May, architect, 3, Great James-street, London:—

A. King	£557 0 0
J. Meredith (accepted)	521 0 0

For the erection of residence at Winchester, Hants, exclusive of principal finishings, for Mr. R. H. Gudgeon. Mr. Fred. A. Walters, architect. Mr. W. H. Brayshaw, surveyor:—

Sims	£2,172 0 0
Fielder & Sons	2,080 0 0
Saunders	1,989 0 0
Bull & Sons	1,930 0 0

For repairs inside and out to nineteen houses, Dragoon court and Montague-street. Messrs. Stone, surveyors:—
Martin & Goddard (accepted).

For rebuilding fronts and inside repairs to two houses, 30 and 31, Umberston-street, for Mr. Mark Jacobson:—
Martin & Goddard (accepted).

Accepted for one pile of Jennison's patent smokeless Decker baking-ovens, for Mr. John Gee, Stanley-street, Macclesfield:—
W. F. Mason, engineer, Longsight, Manchester.

For the erection of a new residence, and additions and alterations to house at Petworth, for the Right Hon. Henry Baron Leconfield. Mr. Edward Burstow, architect, Horsham. Quantities by Mr. S. J. Thacker:—
T. Ennor, Julian, & Co., London (accepted).

For repairs and decorations to Pentonville Congregational Church, King's-cross. Messrs. Saville & Son, architects, 1, Argyle-square, W.C.:—

W. Broil	£532 0 0
J. Steel	416 13 6
T. Hawkins	411 0 0
W. H. Butcher	388 0 0
J. Denning	356 0 0

For building three vineries, peach-houses, conservatory, and other buildings, at Amersham, for Mr. C. L. Shepherd:—
G. Darlington, Amersham (accepted).

For alterations to No. 55, King-street, Hammersmith, for Messrs. Chaplin Bros. Mr. Thomas Durrans, architect:—

Lamble	£335 0 0
Higgs	333 0 0
Birch	310 0 0
Bowles	295 0 0

For Bible Christian Chapel at Lee, Kent. Mr. W. Theobald, architect. Quantities by Mr. B. W. Swinstead:—

		Side galleries.
Boase	£5,048 0	£368 15
Dove Bros.	4,775 0	820 0
Charlwood Bros.	4,675 0	290 0
Gaisford	4,691 0	295 0
J. & C. Bowyer	4,659 0	298 0
Haisman	4,586 0	299 0
Adamson & Sons	4,398 0	298 0
Thos. Watson, Dulwich	4,387 0	274 0
Staines & Son	4,284 0	274 0
Tongue	4,214 0	245 0
Higgs & Hill	4,234 0	266 0
Morris	4,000 0	260 0
Jerrard	3,792 0	235 0
Banks	3,773 15	225 0
Kennard Bros.	3,759 0	220 0

For rebuilding the Storey's-gate Tavern, Westminster. Mr. P. E. Murphy, architect. Quantities by Mr. Edward Clark:—

W. T. Niblett	£3,575 0 0
T. L. Green	3,454 0 0
C. Ansell	3,440 0 0
G. Parker	3,337 0 0
B. Cook	3,331 0 0
H. R. Swain	3,288 0 0
Parrish & Hawker	3,035 0 0

For the erection of Able-bodied, Lunatic, Lying-in, and Receiving Wards, and Administrative Offices at Fulham-road Workhouse, for the Guardians of the Poor of St. George's Union. Messrs. H. Saxon Snell & Sons, architects. Quantities by Mr. Robert Griggs and the architects:—

Nightingale	£37,579 0 0
Crockett	37,258 0 0
Mowlem & Co.	36,500 0 0
Higgs & Hill	36,440 0 0
Perry & Co.	35,960 0 0
Peto Bros.	33,605 0 0
Adcock	33,241 0 0
C. Wall (accepted)	32,590 0 0

For alterations, new shop-front, fittings, &c. at Nos. 314 and 316, Oxford-street, for Messrs. D. H. Evans & Co.:—

F. Sage	£698 15 0
W. Salter (accepted)	693 0 0

For the erection of a villa for Mr. S. H. Dowsett, in Selsdon-road, Leytonstone. Mr. J. W. Brooker, 2, Railway Approach, London Bridge, architect:—

Shurmur	£1,143 0 0
Arber	999 0 0
Battley	997 0 0
Hubble & Trott	879 0 0
Body	830 0 0
Mansfield	807 0 0
Long (accepted)	680 0 0

For the erection of shop premises and basement for Mr. A. S. Robinson, 325, New Cross-road. Mr. J. W. Brooker, architect:—

Hatfield & Son	£419 0 0
Holloway	277 0 0
Hubble & Trott (accepted)	249 10 0

For the erection of stabling, &c., and van-sheds, for Mr. G. Hayward, 355, New Cross-road. Mr. J. W. Brooker, architect:—

Battley	£235 0 0
Hall (accepted)	234 0 0

For the erection of No. 12, New-street, at corner of Bedfordbury, Covent-garden, for Mr. W. Powell. Mr. J. W. Brooker, architect:—

England & Thompson	£2,231 0 0
Battley	2,090 0 0
W. & F. Croaker (accepted)	2,000 0 0

For shop and dwelling at Orpington, for Mr. G. Ogburn. Mr. G. St. Pierre Harris, architect:—

Townsend	£530 0 0
Treadwell	479 0 0
Taylor & Son	462 0 0
Wood	432 0 0
Wait	399 15 6
Haisman	379 0 0
Brett & Son	339 0 0

For house at Orpington, for Mr. J. Peckham. Mr. G. St. Pierre Harris, architect:—

Ottway	£564 0 0
Wright	520 0 0
Taylor & Son	516 0 0
Wood	499 0 0
Haisman	485 0 0

For three blocks of artisans' dwellings, to be called "Grove Buildings," to be built in South Grove, Mile-end-road. Mr. Robert J. Worley, architect. Quantities by Mr. R. C. Gleed:—

	Main estimate.	Add.*	Add.†	Add.‡
G. Green	£18,190	£201	£196	—
E. Lawrance	18,085	742	182	£215
J. Ryder-Hunt§	17,438	767	377	—
Perry & Co.	16,473	730	100	221

* If glazed brick dados to stairs, &c., in lieu of white Suffolk.
† If tile paving to entrances, corridors, and landings.
‡ If 4½-inch brick nog. partitions in lieu of 3-inch to be concrete.
§ Credit for brick nog. partition, 420*l.*

For house and boundary walls at West End-lane, Kilburn, N.W., for Mr. Theo. Vasmer. Mr. Henry John Hansom, architect. Quantities by Mr. Henry Smith:—

John Grover	£2,400 0 0
A. B. Scott	2,397 0 0
Lathey Bros.	2,350 0 0
Gregory	2,300 0 0
B. E. Nightingale	2,292 0 0
Wm. Smith	2,248 0 0
Richens & Mount	2,200 0 0
Turtle & Appleton	2,175 0 0
Stimpson & Co.	2,138 0 0
Dainton	2,130 0 0

For additions to No. 10, Loudoun-road, St. John's Wood. Mr. H. S. Legg, architect:—
W. H. Butcher (accepted).

For the erection of flour-mill, grain-warehouses, river and dock walls, Battersea, and other works (exclusive of ironwork), for Messrs. Marriage, Neave, & Co. Mr. Fred. Bath, architect, London and Salisbury. Quantities supplied :—

Lee & Co.	£12,000	0	0
Everett & Son	11,440	0	0
Wm. Shurmur	10,935	0	0
Wm. Crockett	10,457	0	0
Howell & Son	10,445	0	0
Treweeke & Co.	10,431	0	0
Garrud & Pink	10,383	0	0
J. T. Chappell	10,253	0	0
Henry Lovatt	9,979	0	0
George Howard	9,790	0	0
Mark Gentry	9,735	0	0
Vernon & Ewens	9,450	0	0
Munday & Sons	9,441	0	0
Bull & Sons	9,135	0	0
James Holloway	9,110	0	0
Perry & Co.	8,703	0	0
B. Cooke & Co.	8,677	0	0
Alfred Everett	8,614	0	0
John Garlick	8,499	0	0
Alfred Capsey	8,428	0	0
Edward Bentley	8,418	0	0
Samuel J. Scott	8,235	0	0
John Rider Hunt (accepted)	8,208	0	0
W. H. Wheeler	7,229	0	0
Ironwork.			
Walker, Pendleton, & Co.	£3,150	0	0
R. Moreland & Son	2,940	2	3
Ransome, Josselyn, & Woods	2,812	3	0
Homan & Rodgers	2,698	0	0
Vernon & Ewens	2,690	0	0
A. Handyside & Co., Lim.	2,668	0	0
Howell & Son	2,405	0	0
Matt. T. Shaw & Co.	2,249	0	0
Chas. Williams & Co.	2,229	3	0
B. Cooke & Co.	2,226	0	0
W. H. Lindsay & Co.	2,213	0	0
Rownson, Drew, & Co. (accepted)	2,172	15	0

For works on the Elmhurst Estate of the United Land Company, Upton :—

W. H. Martin, Upton	£4,160	0	0 !
Wilkes & Co., Bishopsgate-street	4,106	0	0
W. J. Botterill, 110, Cannon-street	3,884	0	0
W. Nicholls, Wood-green	3,359	0	0
J. C. Trueman, South Hackney	3,350	0	0
Piell & Sons, Kent	3,335	0	0
J. Pizzey, Hornsey	3,322	0	0
Woodham & Fry, Catford	3,320	0	0
J. Bell, Wood-green	3,312	0	0
J. Bloomfield, Tottenham	3,231	0	0
John Ball, Chiswick	3,132	0	0
Jesse Jackson, Leyton	3,111	0	0
Chas. Taylor, Upper Holloway	3,098	0	0
John Bentley, Chislehurst	3,036	0	0
D. Knight, Wanstead-park	2,997	0	0
J. Jackson, West Ham	2,990	0	0
T. Spurgeon, Forest-gate	2,926	0	0
Wm. Porter, Hackney	2,923	2	0
H. S. Pollard & Co., Burdett-road	2,849	0	0
W. G. Harris, Stratford (accepted)	2,435	0	0
H. Holloway, East Ham	2,395	0	0 !

For Infectious Diseases Hospital, Wokingham, Berks :—

Claridge	£905	0	0
Ford	725	1	6
Pilgrim	687	0	0
Idendon	650	10	6
Allcock (Camberley)	580	10	0
Smallbone	575	0	0
Margetts	568	0	0
Hawkin	559	0	0
Taylor	550	0	0
Neale	527	1	0
Weaver	498	0	0
Partlow (accepted)	473	0	0

For villa residence and drainage at Horsell, for Mr. Friers Marecco. Mr. F. Eggar, architect. Quantities by Mr. J. Bartlett, Woking :—

				Drainage.		
Hayward Bros. Lim.	£1,840	0	0	£234	0	0
Smith	1,599	0	0	129	0	0
Allcock (Camberley)	1,449	0	0	135	0	0
Whelburn	1,430	0	0	112	0	0
Harris	1,520	0	0	Inclusive.		
Gale	1,213	0	0	157	0	0

For additions to schools, Little Ilford, Essex. Mr. J. A. Gotch, architect. Mr. W. Birdseye, surveyor :—

E. Jenner	£1,120	0	0
H. Brown	979	0	0
C. Barnes	933	0	0
Parrish & Hawker	919	0	0
J. Brickell	844	0	0

For the erection of proposed school of art, with house adjoining, at Crouch-end. Mr. B. Swinstead, architect :—

Holmes & Son	£2,404	0	0
Payne Bros.	2,291	0	0
S. Hayworth	2,279	0	0
Gainsford	2,254	0	0
Durnford & Langham	2,216	0	0
Reid	2,200	0	0
Taylor & Parfitt	2,157	0	0
Southcott	2,060	0	0
W. Shurmur	1,980	0	0
Harris & Wardrop	1,944	0	0

For factory building, Sugar Loaf-court, Garlick-hill. Mr. F. Chambers, architect :—

E. Conder	£4,530	0	0
Holland & Hannen	4,428	0	0
King & Son	3,750	0	0
G. Shaw	3,500	0	0
T. Cox	3,498	0	0
J. Grover	3,479	0	0
Greenwood & Son	3,471	0	0
W. Shurmur	3,447	0	0
W. Brass	3,183	0	0

For repairs and alterations to Dyer's almshouses, Mildmay-park, for the Worshipful Company of Dyers. Mr. W. Waymouth, architect :—

W. Shurmur (accepted).

For orphanage in connexion with R.C. convent, Hassett-road, Homerton. Mr. C. G. Wray, architect. Quantities by Messrs. Linsdell & Giffard :—

Adamson & Sons	£7,648	0	0
Greenwood	7,314	0	0
Holland & Hannen	7,282	0	0
Bangs	7,249	0	0
Nightingale	7,140	0	0
Perry & Co. (accepted)	6,899	0	0

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